CANADA $4·50 USA $3·25 Vol 2 No 10 UK £1

COMMODORE

COMPUTING INTERNATIONAL

The Independent Commodore Magazine

SX-64 REVEALED

ROBOTS FOR YOUR MICRO

PROGRAMS – MACHINE CODE AND BASIC

PLUS

SOFTWARE AND HARDWARE FOR PET, VIC AND 64

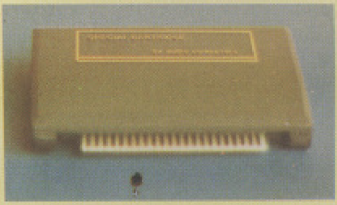
0 10
56698 70151

BELGIUM FR130 FRANCE FR18.5 GERMANY 6DM

FROM AUDIO-COMPUTERS (SOLIDISK) THIS MONTH:

NEW LOW PRICES ON VIC-20 HARDWARE ADD-ONS AND THE INTRODUCTION OF NEW SOFTWARE CARTRIDGES

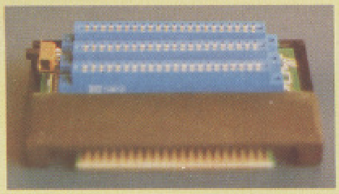
If you have already bought a memory cartridge for your VIC-20 computer, we still have many exciting items to offer, under the heading 'FURTHER EXPANSION'. They are perfectly compatible with all Commodore and many other manufacturers products.



NEW LOW PRICE ON 16K MEMORY CARTRIDGE:

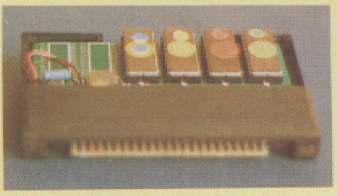
Any program sold for the VIC-20 with 8k or 16k extra memory will run with the SRC16.
The NEW PRICE of the SRC16 is now only £27.00, including VAT and manual.
It is important to know what else you can do with the SRC16 other than running big programs.
1) The SRC16 can be upgraded to 32k bytes of RAM at a fraction of the cost of a 16k cartridge. This upgrade costs only £11.00
2) The SRC16 has an X-ROM SOCKET. Games or utilities ROMs such as SCREEN ROM or SOUND ROM can be bought separately and used in this socket. Each software ROM costs around £5-10.00.
3) The SCR16 can have an EXPANSION SLOT built in. This important fact should be noted, since many VIC users experience fitting problems and extra expense when adding a Programmer's AID toolkit cartridge or the Machine Code Monitor Cartridge to their system. With many other low cost 16k memory cartridges, the user will have to buy a multi slot motherboard just to accommodate any extra cartridges. This feature alone could save you as much as £20! The SLOT is the exact reproduction of the expansion port into which the SRC16 is inserted and will cost you only £3.00. Right now you can choose any of the extra features to be built into your SRC16 cartridge. Simply tick the option boxes shown.

FURTHER EXPANSION TO THE VIC-20 COMPUTER:



1) 3 SLOT MOTHERBOARD:

for those for whom it's too late to buy a SRC16 cartridge or who want more than just memory. The 3 Slot MOTHERBOARD is not without special interest:
a) A Memory Select System allows the user to add the memory capacity of 2 RAM cartridges — for example, an SRC16 and a Commodore VIC-1111 can be used together to provide 32k bytes.
b) An optional 8k Memory System, very flexible, that will give 11775 bytes free or 6655 bytes free in the Low Res area or occasionally 8k bytes at $A000 to $BFFF for developing your own Autostart program can be added. Furthermore, if you then add your SRC16, you will get 28159 bytes free for your VIC 20!
c) 2 EPROM SOCKETS: this feature is very much appreciated by most users and has been added only very recently. You can use either 4k EPROMs (2732) or 8k EPROMs (2764) in these sockets. Each EPROM can be activated individually exactly as if you had 2 extra cartridges in your system!



2) THE VIC EPROM PROGRAMMER: (uses 2764 Eproms)

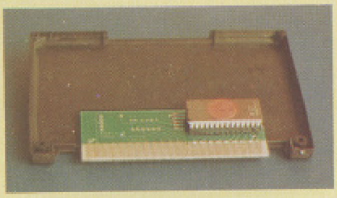
We would need a whole page to describe this exciting peripheral for your VIC-20. Briefly, the cartridge works a little like a Disk. You can insert the VIC EPROM PROGRAMMER (VEP for short) into the SLOT and activate it with:

```
SYS 39000
```

On the VEP, you will find 4 EPROM sockets. Now type in 'C' to display the catalog. It will show what is in every EPROM. It could be like this:

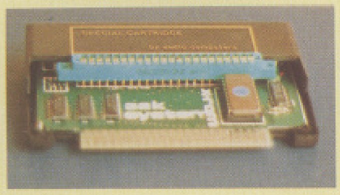
```
1.  BIGBASIC           Simply enter 'R.1' to read the first program. You will instantly see:
2.  UTILITY            *READING BIGBASIC
3.  AUTOSTART GAME     *READING OK
4.  BLANK EPROM        READY
```

Now you can list it, print it, run it etc. . .
The VEP does the loading of a 16k program in about 3 seconds with no loading error unless you have a bad RAM; it will then list out all the dead or missing bytes!
To put a program into EPROM, load it from tape or disk, activate the VEP and enter 'W PROGRAM-NAME' — very simple to do. Other useful commands provided by the VEP include Hex Memory Display, Memory Change, Memory Fill, Memory Transfer, Save a Block of Memory, Load Tape, Cold Start, Centronics Printer Drivers etc. . .
You can put Basic, utility or autostart games onto Eprom in a similar way. The VEP will work out where your program is stored and will scan the EPROMs to find enough space to put it.
You can also use it as a self contained Eprom programmer to program, verify and copy Eproms.
Utility and Autostart EPROMs made with the VEP can be used on our Motherboard or on our BLANK SOFTWARE CARTRIDGES and used as any software cartridges.
We supply a small manual together with the VEP showing how you can write an Autostart program, in Basic and in machine code. We will also supply you with a free Blank EPROM and a free Blank Software Cartridge to get you started.
A word of warning: we have developed this equipment to help users in materialising sellable software (we are very keen to buy) and will disclaim any illegal use of it.



SOFTWARE CARTRIDGES

(insert directly into back of VIC, into Motherboard or SRC slot).
1) SCREEN CARTRIDGE: Sets the screen size within limits as small or large as you like. You can for example set the screen to 40 lines × 80 columns and a 'window' of 25 lines × 30 columns, write a letter or draw a colourful playing board and move your window with control keys or joystick. As you are typing in, the window will move along to accommodate. Basic programs can be typed in, listed and run even in 80 column format. Price £10.00.
2) SOUND CARTRIDGE: transforms your VIC into an electric organ. You can play music with the keyboard, add a second voice when it plays the 1st, a 3rd when it plays back the 1st and 2nd etc, define ENVELOPE to create effects like wailing police siren, play music within basic program without slowing the speed of Basic. In short, the sound Rom makes the VIC as tuneful as the BBC micro or the ATARI. Price: £10.00
These 2 cartridges are also available in chip form. You can use the chips in the Motherboard or in the X-ROM socket of your SRC16. Price: £8.00 for either of the 2.
3) MORE CARTRIDGES will be released. We would like to market your programs in cartridge form. Alternatively, we can supply blank cartridges at very competitive prices for commercial use. We are just a phone call away so if you have a good idea, why not give us a ring?



SUMMARY	PRICE/U INCL. VAT
SRC16	£27.00
OPTIONAL EXTRAS FOR THE SRC16:*	
UPGRADE TO 32K	£11.00
EXPANSION SLOT:	£3.00
FURTHER EXPANSION:	
3 SLOT MOTHERBOARD:	£19.95
OPTIONAL EXTRA 8K FOR MOTHERBD*	£16.00
VIC EPROM PROGRAMMER (+ free gift)	£39.00
EXTRA 2764 BLANK EPROM:	£6.00
BLANK SOFTWARE CARTRIDGE:	£3.00
SOFTWARE CARTRIDGES:	
SCREEN CARTRIDGE:	£10.00
SCREEN ROM ONLY:	£8.00
SOUND EFFECT CARTRIDGE:	£10.00
SOUND EFFECT ROM only:	£8.00
Post and packing:	£1.00
TOTAL:	

*I enclose a cheque/postal order payable to SOLIDISK LTD for £:
*Please charge my Access/Barclay credit card account No:
(*Please delete/complete as applicable)

....

Signature

Name: Mr/Mrs/Miss: ....

Address: ....
....
....

Please note: optional extras cannot be purchased alone. Also, if you wish to purchase them at a later date, SRCs and Motherboards must be returned together with the appropriate payment + £1 P+P. We regret we cannot accept orders of less than £10.00. All prices include VAT at 15%. Europe: deduct VAT, add £3.

Official UK dealers:

SUMLOCK, Manchester, Norman DAVIS, Mill Hill, GODFREY'S, Basildon, CURRY'S MICROSYSTEM chain store.

Official European distributors:

Benelux: ECD, Delft Tel 015 134429.
France: RUN informatique sarl, Paris Tel (01) 581 5144.
Germany: VOBIS Data computer GMBH, Aachen Tel (0241) 50 00 81.
SCHAEFER, Roetgen Tel (0240) 88 319.
Italy: SOLIDISK Italia, Inglesias (CA), Tel 0781 22529.
Portugal: LANDREY-Engineering, Lisboa Tel 681243.
Sweden and Norway: DIGILOG, Goteborg Tel 031 20 29 00.

Thank you for the interest shown. Marketing Manager: H. PERRY

TO: SOLIDISK TECHNOLOGY LIMITED
(T/A AUDIO COMPUTERS)
87 BOURNEMOUTH PARK ROAD
SOUTHEND ON SEA
ESSEX SS2 5JJ UK

OUR TELEPHONE NUMBER:
CREDIT CARD SALES/
DEALER ENQUIRIES: **0702 618144**

ENQUIRIES: **0702 613081**

COMMODORE
COMPUTING INTERNATIONAL

MARCH 1984

COVER STORY

COMMODORE
SX-64
REVEALED

The SX-64, Commodore's new portable version of the 64, is put through its paces in this issue.

Published by Nick Hampshire Publications, 167-169 Great Portland Street, London W1.

Managing Editor	Nick Hampshire
Consultant Editor	Peter Arnott-Job
Assistant Editor	Sue Pearce
Features Editor	Martin Bush
Staff writer	Sally Wood
Technical Editor	Richard Franklin
Programmer	Carl Graham
Advertisement Manager	Peter Chandler
Sales Executive	Paul Fenton

Telephone:

Editorial	01-636 6531
Advertising	01-636 6408
Subscriptions	01-636 6354

Distribution by Magnum Distribution Ltd, Chronicle House, 72-78 Fleet Street, London EC4Y 1HY.
Printed by Ambassador Press, Radlett Road, Colney Street, Radlett, St Albans, Herts AL2 2EG.

© Nick Hampshire Publications 1983.

ISSN 0265-475X

Commodore Computing International – an independent magazine for Commodore computer users – is not connected in any way with Commodore Business Machines U.K. Ltd. It is published 12 times per year by Nick Hampshire Publications Ltd. The Publishers do not accept liability for any incorrect statements or errors contained in material from independent sources or authors which may be reproduced from time to time.

NEWS 5
Keeping up with all that's happening in the computer world

PRODUCT NEWS 6
The latest hardware and software for Commodore users

SX-64 16
We review Commodore's new portable version of the 64

ROBOTICS 18
A look at robotics accessible to the general public

GAMES 22
More recent arcade and adventure games for the VIC and the 64 reviewed this month

PROFILE 30
A look back at the career of Jack Tramiel, founder of Commodore

SOFTWARE REVIEWS 33
Including Commodore's own wordprocessor, Easyscript

HARDWARE REVIEWS 37
A speech synthesiser and a light rifle

INTERFACING 38
Owen Murcott continues his series with a two-machine game

HINTS AND TIPS 47
More ideas including how to use the error messages on the 64

BASIC PROGRAMMING 53
With a Machine Code display routine

INSIDE BASIC 56
The memory map of the 64, in two parts

MACHINE CODE 58
Four routines for the 64 to aid programming

BUSINESS PRODUCTS 69
The latest products for business users of Commodore machines

BUSINESS SOFTWARE 75
Looking at two accounts packages for the PET

BUSINESS HARDWARE 78
We review the latest products for use in business

PRODUCT SURVEY 80
A look at payroll programs for the 8000 series

APPLICATIONS 90
How a PET is used in the physics department of King's College

THE INTERNATIONAL VIDEO GAME OF THE YEAR COMPETITION HERALDS THE "NEW AGE" IN VIDEO/COMPUTER GAMES

$175,000 TO BE WON

CREATE A NEW VIDEO
GAME AND YOU COULD
MAKE YOURSELF A
MILLIONAIRE
AND THAT'S JUST FOR STARTERS!
IRP
International Video Game of the Year

Create a brilliant, new video game and you could be on your way to becoming a millionaire. This fantastic competition, organised by I.R.P. (The International Register of Independent Computer Programmers Ltd) and the famous Mark McCormack International Management Group, offers programmers and inventors the opportunity of a life time. There are huge, immediate cash prizes and the on-going revenue of 10% of the sales of all games to distributors throughout the world, plus the chance to appear on an international TV show. Your skill and imagination could bring you fame and fortune!

$100,000 FIRST PRIZE! PLUS FIVE $15,000 RUNNER-UP PRIZES!

Devise a totally original new video game in one of these categories: SPORTS, SIMULATORS, ARCADE, STRATEGY, ADVENTURE/FANTASY or a special section which covers programmes that are not necessarily games but have outstanding Educational or Entertainment merit. We'll also be announcing a number of 'MERIT' awards which will be entitled to carry the message 'An International Video Game of the Year MERIT AWARD' on their retail packaging. It's a great challenge. And the rewards, both financially and in terms of prestige, are tremendous. This is the most exciting competition ever for creative computer and video enthusiasts.

YOU'RE A TV STAR TOO! All six winning games and their inventors will be featured on an internationally distributed, spectacular TV special. That's going to make your name!

HOW TO ENTER

Just send in your game, or games, programmed on cassette for any popular home computer. Use the coupon, today, and we'll send you all the facts you need.

CLOSING DATE FOR ENTRIES IS 31st MAY 1984

To: IRP Limited, Pinewood
Film Studios, Iver, Bucks,
England.

Name ....

Address ....

....

....

CC1

....

Record sales as Tramiel quits

Just days after Commodore announced record worldwide sales for this calender year, the resignation of Jack Tramiel, founder and Chief Executive of Commodore was announced.

He will be succeeded by Marshall F. Smith, president and chief executive of Thyssen-Bornemisza Inc who took up the post on February 21, 1984. Mr Smith is known to be an excellent businessman and has a history of successful management in industries both in the USA and Europe.

Worldwide, Commodore sales went up to $1 billion this calender year compared to $50 million seven years ago. Commodore (UK) contributed substantially to this and in 1983 they sold over 750,000 computers.

Jack Tramiel's long career with Commodore has seen phenomenal expansion and he will continue to assist the company as a consultant and adviser.

Pirate threat to software

It is estimated by the British Guild of Software Houses that for every single game sold, up to ten pirate copies are made. An estimate that is increasingly worrying software publishers, especially as the value in lost sales amounts to at least £100 million!

Most of the 300 or so British software houses are hit by this illegal competition and stand to suffer losses, so plans are afoot to devise ways of combating the problem.

For further information **contact** Nick Alexander, Virgin Games. Tel: 01-221 7535.

Debut for Mycomp

A personal computer show, called Mycomp, is being held on November 1-4 in the Fulcrum Centre, Slough. Organised by Swan House, the Slough Corporation and the centre itself, the show is hoping to attract schools, families and businessmen.

Contact: Steven Mindel, Thames Meadow, Walton Bridge, SHEPPERTON, Middlesex. Tel: 0932 243866.

Wanted

Now is the chance for whizz kid computer game inventors to prove themselves. K-Tel, following the success of their initial launch into the computer software market, are looking for more ideas.

They are especially interested in games for the Commodore 64 and are looking for inventive, original and fun ideas. The best games will be selected for marketing. Interested parties should **contact** Mike Dixon, K-Tel International, 620 Western Avenue, LONDON W3 0TU. Tel: 01 992 8055.

Slinky
Pooyan
Zaxxon
Caverns of Khafka
O'Riley's Mine

Six new games from America have been imported into the UK by Centresoft. Zaxxon, Pooyan and O'Riley's Mine retail at £14.95 and the other three are selling for £9.95.

Camps compute

Parents anxious to introduce their offspring to the computer world should consider Camp Beaumont. Courses are designed for complete beginners as well as the eager expert and are supervised by professional staff.

Courses in the curriculum include Logo, Basic for Beginners, Intermediates and Advanced programmers, Machine Code, word processing etc. A number of sports and other recreational activities fill the gaps between computer classes.

The Camps are based all around the country and the prices range from £58 for 3 days to £118 for 7 days. Both prices exclude VAT.

Contact: Beaumont Computer Workshops, 73 Upper Richmond Road, LONDON SW15 28Z. Tel: 01-870 9866.

New HQ

Recent expansion has prompted Intelligence (UK) to move from their Wimbledon Offices to Network House, Ariel Way, Wood Lane, London W12.

Join the club

Two new Commodore user clubs are the Wigan and North Gloucestershire Computer Clubs. They are both oriented to Commodore products; Pet, CBM 64, Vic 20 and their peripherals. In the very near future, Commodore Computing International will be publishing a special feature on Commodore clubs in the UK and elsewhere and welcome any information people have on their own clubs.

Contacts: NORTH GLOS CLUB, RC Harvey. Tel: 0242 527588 and WIGAN CLUB, AF Owen. Tel: 0942 212662.

PRODUCT NEWS

Cross compile

Cross Compilers for the CBM 64 and the 700 are now available from Oxford Computer Systems. The cross compilers enable programmers to generate object and source codes on the 8000 series from the CBM 64 and 700 series respectively.

For the 700 series, the two products involved are the B-port, a version of Petspeed and the X-700, a version of the Integer Basic Compiler. Both are supplied on disk, retailing at £450 each.

The two cross compilers for the CBM 64 are the Portspeed, a suite of programs and the X-64, an integer compiler. Both are supplied on disk, retailing at £150 each.

Contact: Oxford Computer Systems, The Old Signal Box, Hensington Road, Woodstock, OXFORD OX7 1JR. Tel: 0993 812700.

Micro music

Musically-minded 64 owners will be interested in the full size keyboard, retailing at £130 + p&p from Autographics Ltd.

No external power is needed for this 4 octave C-to-C keyboard. It has two user definable sliders and an expansion slot allowing for developments. The controlling software is menu driven and simple to use, giving the user complete control of all Sid Chip parameters. Envelope Parameters are graphically represented and sounds can be recalled and stored.

For use with a cassette or disk and additional programs are available including sequencing and tuition.

Contact: Autographics Ltd, 3A Reading Road, HENLEY, Oxon, RG9 1AB. Tel: 0491 575469.

SX-64 arrives

The Commodore SX-64 portable, the executive version of the 64 is now available in the UK. Aimed at the businessman, salesman, and anyone who has to travel, it costs £895 including four free software packages.

The SX-64 can be transported and set up any where with a mains power outlet. Incorporated into the set is a 5 inch colour monitor, a 5¼ inch floppy disk drive and the detachable keyboard doubles as a lid. Commodore claims that it could be used in the 'home', but although it has a port for paddles, joysticks, lightpens etc it has no cassette interface.

Demand for this product has outstripped its supply, but Commodore are flying them over from the USA on a monthly basis.

High score competition

Livewire have produced three new games; Gridtrap, Jumpin Jack and Triad for the CBM 64, costing £8.95 each.

A 'High Score Competition' Entry form comes with each game giving players an extra incentive to score points. Any claim should be submitted with the form for validation. First prize is a Commodore 1541 Disk Drive. Second prize is a Commodore 1520 colour printer plotter. Third prize is a Simons Basic package and the seven runner-up prizes are pro-ace competition joysticks. The closing date for the competition is March 1 1984.

The three games will appeal to all age groups and 3D dimensional graphics have been used to inject the games with new perspectives. In October of this year Sumlock will be introducing the Pro Ace Joystick designed for the Vic 20 and CBM 64. Costing £12.95, its 2 year warranty is some indication of its reliability.

Contact: Sumlock Microware, 198 Deansgate, Manchester M3 3NE. Tel: 061-834 4233.

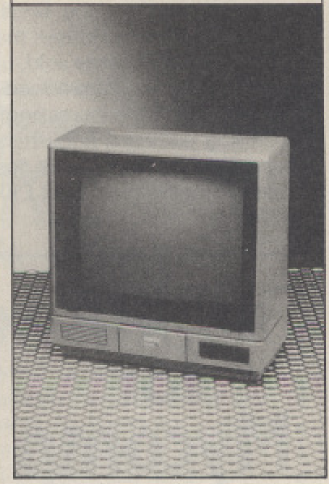
Supercat info

Two catalogues specialising in electronics, industry and research in general have been issued free by Supercat Electronics Ltd.

The January issue of the Electronics catalogue covers measuring instruments, leads, connectors, accessories and kit among other things. The direct mail catalogue deals with Multimeters, Oscilloscopes, Meggers and much more. The next issue will be coming out in the summer.

Contact: Supercat Electronics Ltd, PO Box 201, St Albans, Herts, AL1 4EN. Tel: 0727 62171.

First timer



Micro Peripherals Ltd have brought out what they claim is the first all-in-one British built colour monitor – the CM14 for £199.

The 14 inch colour monitor is compatible with Commodore machines and can receive RGB, RGBY, PAL COMPOSITE and audio signals.

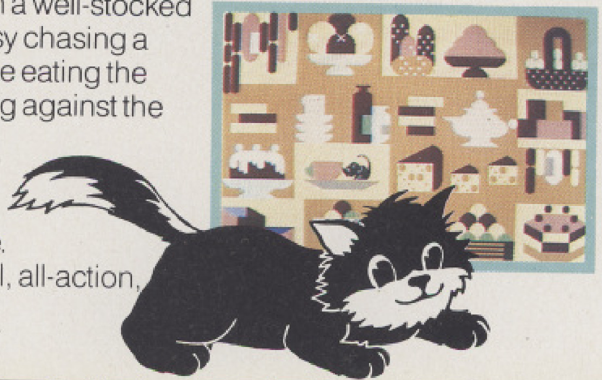
Contact: Micro Peripherals Ltd, 69 The Street, Basing, BASINGSTOKE, Hants. Tel: 0256 3232.

More than fun and games!

CÆSAR THE CAT

by Andromeda Software

You will have more than fun and games when you meet Caesar, a cheeky young cat on duty in a well-stocked larder. He's kept busy chasing a gang of hungry mice eating the family's food. Playing against the clock, you guide Caesar along crowded shelves to pounce on the mice.



A fast, colourful, all-action, arcade-style game which is winning praise from reviewers.

'A marvellous, truly addictive game which also manages to be original, it has few peers.' ***Popular Computing Weekly***

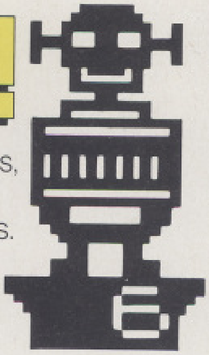
'It's not possible to compare this game with anything I've seen before . . . Excellent.' ***Soft***

'Lovely graphics, and a fine entry into the market from Mirrorsoft.' ***Which Micro***

There's catchy music and a best-score record. Caesar the Cat is a challenge for high-scoring arcade addicts (has anyone reached a score of 10,000 yet?) as well as great fun for the novice.

Available on Cassette for the Commodore 64.

QUICK THINKING!



by Widgit Software

Two mind-stretching, space-age games to test mental arithmetic and nimble fingers.

In **Sum Vaders** alien robots invade the earth. Only quick thinking and fast reactions can prevent them. Several levels of difficulty and a two-player game with a handicap option make Sum Vaders equally testing for all family members, from 8 years to adult.

Robot Tables challenges the young player to make a series of perfect robots. With a learning mode and a testing mode this game is a fun way for early learners, and more advanced children, to master their multiplication tables.

Available now on cassette for the Commodore 64 (and also the Spectrum 48K, BBC B and Electron).

MIRRORSOFT programs are available from selected branches of W.H. Smith and Boots, and other leading software stockists. Trade enquiries welcome: phone 01-822 3580.

MIRRORSOFT

SOFTWARE FOR ALL THE FAMILY

To MIRRORSOFT, PO Box 50, Bromley,
Kent BR2 9TT
Please send me the following (enter number required of each item in the space provided):

	Price	Spectrum 48K (01)	BBC B (03)	Electron (04)	CBM 64 (05)
Quick Thinking (QT01)	£6.95				
Caesar the Cat (CC01)	£8.95				

Prices include VAT and post and packaging.

I enclose a cheque/PO for £....................made payable to "Readers' Account: Mirror Group Newspapers Ltd".

I understand that my remittance will be held on my behalf in the bank account named above until the goods are despatched.

Or please debit my ACCESS/BARCLAYCARD for the sum of £..............................
card no ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

CI1

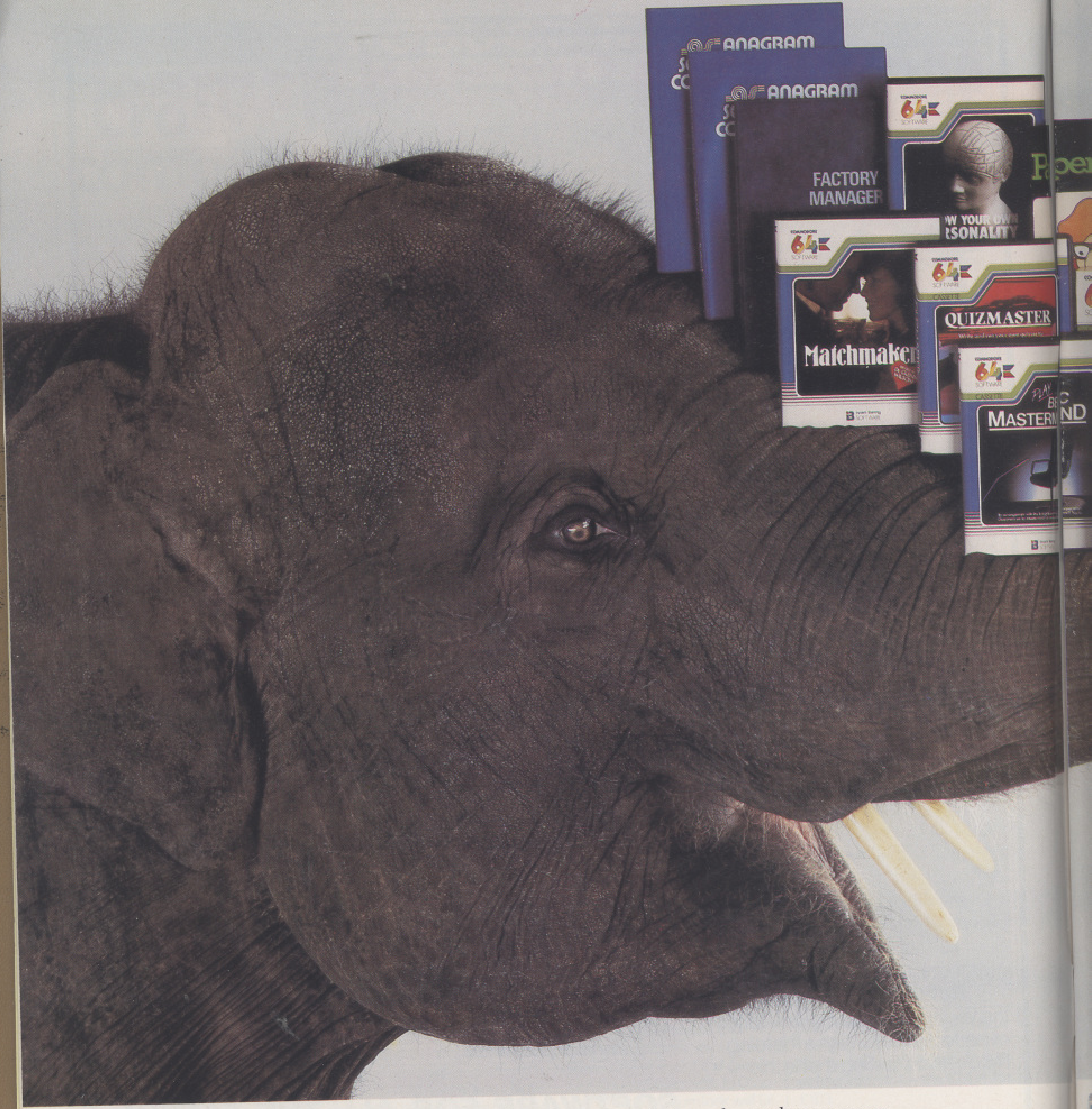
Signature..............................

Name..............................

Address..............................

..............................Postcode..............................

Offer applies to Great Britain and Eire only. Please allow up to 28 days for delivery in the UK. MIRRORSOFT is a registered trade mark of Mirror Group Newspapers Ltd., Co. Reg. No: 168660. Reg. Office: Holborn Circus, London EC1.



The problem with many home computers is there's often very little software to go with them.

Or all that is available is games, games and more games.

There's no such problem, however, with the Commodore 64. It has a more extensive range of serious software than any other home computer.

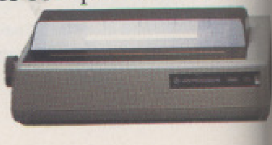
It also has an unusually large (in fact elephantine) 64K memory, as well as every peripheral you're ever likely to need.

All of this means you can run more interesting, entertaining and complex programs.

You can teach yourself many different subjects, even computer programming. There are programs for the office and, when you're mentally exhausted, yes, there are even games.

However, we have to admit that in one respect the Commodore 64 does fall short of the competition. It costs around £229, much less than any comparable machine.

And that's one fact we hope you'll never forget.



PaperClip
PETSPEED 64
START PROGRAMMING WITH GORTEK AND THE MICROCHIP
HIGH FLYER
GCE O' LEVEL
MATHEMATICS
PHYSICS
CHEMISTRY
GEOGRAPHY
HISTORY: 20TH CENTURY
BIOLOGY
SOOPER FROOT
DEPTH CHARGE
AN INTRODUCTION TO BASIC- PART 1
EASY SCRIPT
COMPREHENSIVE WORD PROCESSOR
SIMONS BASIC
ADDITIONAL PROGRAMMING COMMANDS
RADAR RAT RACE
STELLAR WARS
MAGGOTMANIA
LASERZONE
SUPER BLITZ
MATHEMATICS 2
ENGLISH LANGUAGE
PHYSICS
BIOLOGY
CHEMISTRY
HISTORY: 20TH CENTURY
GEOGRAPHY
commodore COMPUTER
commodore

When you have an enormous memory there's no end to the things you can do.

Please send me further information on: the 64 computer ☐ 64 software ☐ disk drive ☐ cassette unit ☐ printers ☐ monitor ☐

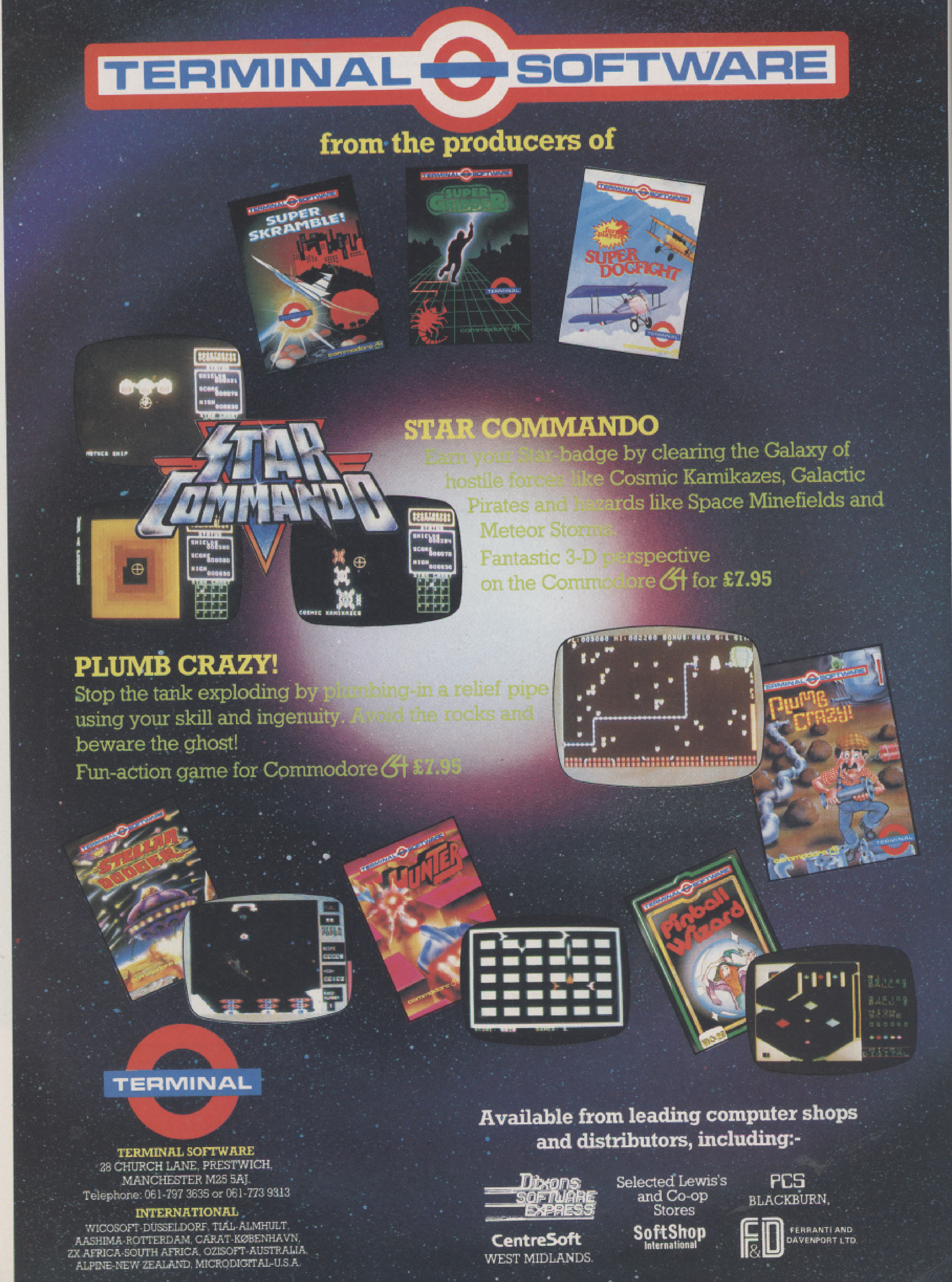
Name (Mr. Mrs. Miss)

Address

Send to: The Commodore Information Centre, 675 Ajax Avenue, Slough, Berkshire SL1 4BG. Or telephone (0753) 79292.

commodore

6SCIC0384


SUPER SKRAMBLE!
SUPER GRIDDER
SUPER DOGFIGHT
STAR COMMANDO
Plumb Crazy!
STELLAR DODGER
HUNTER
Pinball Wizard
commodore 64

TERMINAL SOFTWARE

from the producers of

STAR COMMANDO

Earn your Star-badge by clearing the Galaxy of hostile forces like Cosmic Kamikazes, Galactic Pirates and hazards like Space Minefields and Meteor Storms.

Fantastic 3-D perspective on the Commodore 64 for **£7.95**

PLUMB CRAZY!

Stop the tank exploding by plumbing-in a relief pipe using your skill and ingenuity. Avoid the rocks and beware the ghost!

Fun-action game for Commodore 64 **£7.95**

TERMINAL

TERMINAL SOFTWARE
28 CHURCH LANE, PRESTWICH,
MANCHESTER M25 5AJ.
Telephone: 061-797 3635 or 061-773 9313

INTERNATIONAL
WICOSOFT-DÜSSELDORF, TIAL-ALMHULT,
AASHIMA-ROTTERDAM, CARAT-KØBENHAVN,
ZX AFRICA-SOUTH AFRICA, OZISOFT-AUSTRALIA,
ALPINE-NEW ZEALAND, MICRODIGITAL-U.S.A.

Available from leading computer shops and distributors, including:-

Dixons Software Express

Selected Lewis's and Co-op Stores

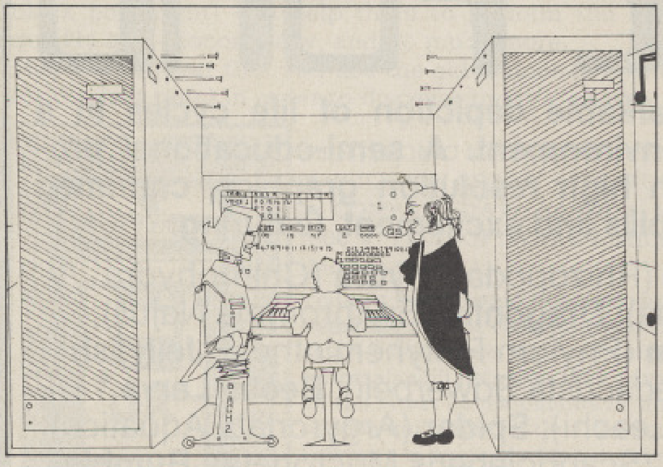
PCS
BLACKBURN.

CentreSoft
WEST MIDLANDS.

SoftShop International

F&D FERRANTI AND DAVENPORT LTD.

Making music



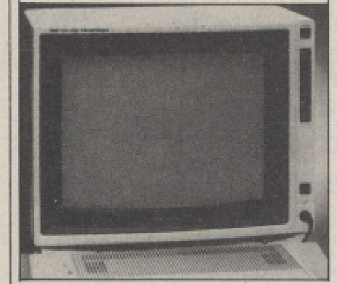
Aspiring musical composers will welcome Ultisynth 64, Quicksilva's new music processor. Priced at £14.95 the package includes an instruction manual.

Musical programs can be composed note by note and all the sounds of the orchestral instruments can be synthesised – piano, strings, woodwind, percussion etc. These can be played alone or together. For dramatic effects trains, thunder, flying saucers can be added.

Special features include four wave forms, modulation, synchronisation, editing facilities and three voices.

Contact: Quicksilva Ltd, 13 Palmerton Road, SOUTHAMPTON, Hampshire SO1 1LL. Tel: 0703 20169.

Sony TV



Sony have launched the KV1430, a 14 inch colour television specially designed for use with the home computer, retailing at £249.

The computer unit can be plugged into the RF socket on the front of the set and linked directly to the TV screen providing an instant connection for games etc. Vertical styling of the screen enables easier viewing.

The KV1430 is available from Sony dealers all over the country.

Petcomm

The Petcomm launched recently by Cortex Computer Systems Ltd enables one PET to communicate with another on a local or remote basis.

The package provides facilities for simple file transfer; error checking; file existence and disk capacity checking; relative and sequential file handling and file editing. The Petcomm is suitable for both floppy and hard disks.

Three versions are available; the Starter Kit retails at £970 and contains an operating manual, a 12 month warranty, 2 floppy disks and 2 interfaces. In addition there is the add-on package for existing Petcomm users at £695 and a second configuration with software costing £265.

Contact: Cortex Computer Systems Ltd, Cortex House, 5 Union Street, BEDFORD MK40 2SF. Tel: 0234 217721/2.

Education offensive

Commodore has launched a campaign to monopolise the hotly contested Education market. By offering computer systems with substantial discounts to schools they hope to present themselves as the viable alternative to other products.

This move coincides with the end of the Governments assisted purchase scheme which encouraged schools to introduce computers (what a coincidence!).

The package comprises the CBM 64, 1541 single floppy disk drive, LOGO (an advanced computer-aided instruction language) and Simons Basic 1 (programming aid). They are offering it to educational establishments for £299.99, a saving of £170. The offer is open until April 30, 1984.

Contact: All approved Commodore dealers in the U.K.

Hunchback

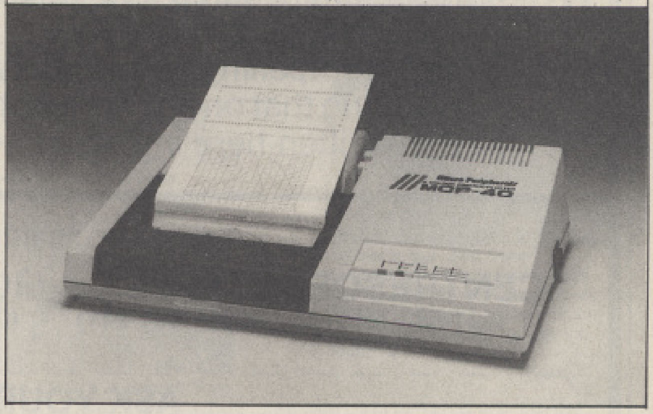
'Hunchback' the popular arcade game has been released by Ocean Software Ltd in program format for the CBM 64. Retailing at £6.90 it can be played with a keyboard or joystick.

The game has fifteen levels of difficulty and Quasimodo's aim is to rescue Esmeralda from imprisonment in the castle.

Contact: Ocean Software Ltd, Ralli Building, Stanley Street, MANCHESTER M3 5FD.

Tel: 061 832 9143/7049 and all major software outlets.

Printer/plotter



A printer/plotter, the MCP-40 has been designed by Micro Peripherals Ltd for the home computer. Priced at £113 excluding VAT.

By interfacing the MCP-40 to the CBM 64 the plotter can print out graphs and charts in four colours. It has a 80 column capacity and a printing speed of up to 12 characters per second.

Contact: Micro Peripherals Ltd, 69 The Street, Basing, BASINGSTOKE, Hants. Tel: 0256 3232.

Starcade presents

SAVAGE POND

A truly remarkable depiction of life cycles in a freshwater environment. A semi-educational programme with high resolution graphics, crammed with thrills, spills and excitement, featuring:

ATARI™

COMMODORE 64™

£8.95
DISK OR CASSETTE

Amoeba (Rhizopoda); **Hydra** (Chlorohydra Viridissima); **Dragonfly** (Erythromma Najus); **Bloodworm** (Phylum Platyheminthes); **Jellyfish** (Craspedacusta Sowerbeii); **Beetle Larva** (Macroplea Leachi); **Spider** (Argyronata Aquatica); **Water Fleas** (Scapholeberis Mucronata); **Bumble-Bee** (Bombas Lapidarius); *and our special guest star*

THE COMMON FROG

(Rana Temporaria)

Awesome . . . *in its conception*
Brilliant . . . *in its depiction*
Dynamic . . . *in its execution*

"Savage Pond is a real joy. A totally unique concept, well thought out and superbly programmed. Whilst a far cry from the usual arcade action it retains all of the excitement. It is an ideal family game and children and adults alike will marvel at the graphics and storyline . . . you will not find such an original and compelling game anywhere else. Buy it and sit back knowing that one of the most original games ever programmed was written here in Britain." — *PAGE 6* — an Atari Users Magazine.

DISTRIBUTED BY

CENTRESOFT	**P.C.S.**	**LIGHTNING**	**CALLISTO**	**TIGER**
(021-520 7591)	**(0254-691-211)**	**(01-969 5255)**	**(021-643 5102)**	**(051-420 8888)**

ASK YOUR LOCAL DEALER OR POST THIS COUPON

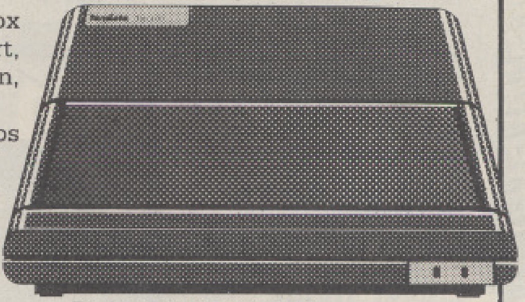
IF IN DIFFICULTY RING OUR **SUPERFAST CREDIT CARD SALES LINE:**
051-487 0808 (24 hours)

STARCADE SOFTWARE, 2 Elworthy Avenue, L26 7AA.

Please rush me .... copies of **SAVAGE POND** suitable for Atari/Commodore 64 (DISC/CASSETTE).
(Delete as necessary.)
Please debit by Access Card
Card Number ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
I enclose Cheque/P.O. for £...........
Name ....
Address ....
....

Communications FROM £99

After many years of typing letters and placing them in the box (below left), some people will be surprised to learn that the smart, black box (right) will help them to perform the same function, quickly and economically, and do much more.
May we suggest that you use the old-fashioned method (perhaps for the last time) in order to discover today's alternative.



Tandata Smart Modem 1984
BT approved

POST OFFICE
4
GR

Post Box c.1938
GPO approved

ELECTRONIC MAIL • PRESTEL • BULLETIN BOARD • TELECOM GOLD • COMPANY DATA BASES • MICRONET 800 • TELESOFTWARE & MICRO TO MICRO CHAT.

Today's fast-moving business environment demands instant communication. Tanadata's smart modem and data communications terminals will help you take advantage of all the latest developments in the communications field. Special terminal and Prestel Software is available for a number of Micros to drive the smart modem range—and some have downloader software also! BBC, APPLE, COMMODORES, IBM PC, and soon CP/M MICROS.
For more information fill in the coupon or clip your letterhead to this ad.

Tandata

Tandata Marketing Limited,
Albert Road North, Malvern, Worcs. WR14 2TL
Telex: 337617 Prestel * 799 # Telecom Gold: TAN 001

Name ....

Company ....

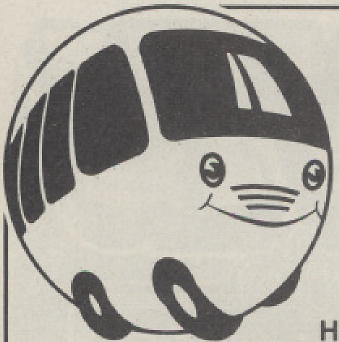
Address ....

....

..........Tel ....

C/3/84

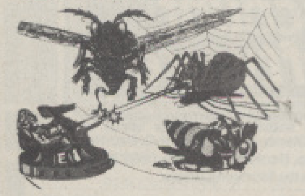
Tandata Marketing Limited, Albert Road North, Malvern, Worcs. WR14 2TL
A subsidiary of Tandata Holdings Plc Telex: 337617 Prestel * 799 # Telecom Gold: TAN 001



bubble bus software

original, top quality games for the Commodore 64 – at only £6.99 each

EXTERMINATOR



Definitely one of the best arcade action games around for the 64. Shoot the worm and everything else in the garden whilst avoiding the deadly spider and swooping eagle. Machine code using high resolution and Sprite graphics with excellent sound. Beware, it's very addictive.

OTHER CBM 64 TITLES:
QUIZZER
LABEL PRINTER
POSTER PRINTER
ADVERTISER

HUSTLER

Written in machine code and using Sprite graphics HUSTLER takes the 64 to its limits. There are six 'pool' type games for one or two players, high scores kept and super music. Machine code. See the great press reviews.

VIC 20 TITLES:
EXTERMINATOR
ANTIMATTER SPLATTER
THE CATCH
QUIZ MASTER
POST
LABEL
FLOWCHARTER

KICK-OFF

A unique game based on the famous Table Football game with the moving rods through the players. Amazing graphics and music. For one or two players. Two players use two joysticks simultaneously. Machine code.

WIDOWS REVENGE

Similar to our 'Best Seller' Exterminator, but this game fires back! Obliterate all of the Widows Warriors but watch out for Photon Webbs and devious Egg Layers. Machine code.

bubble bus *products are available from:*
LIGHTNING DEALERS – SPECTRUM SHOPS – GREENS – SELECTED H.M.V. SHOPS – GAMES WORKSHOPS – CENTRESOFT STOCKISTS – PCS STOCKISTS – LASKYS – W.H. SMITH
If you have any trouble buying our products, you may buy direct.

bubble bus software, 87 High Street, Tonbridge, Kent TN9 1RX

Please send me__________ Name __________

__________ Address__________

__________ __________

I enclose my cheque/Postal Order for £_____ please add 50p for post and packing

LEVEL 9 ADVENTURES

BBC 32K ***COMMODORE 64*** ***SPECTRUM*** 48K
LYNX 48K ***NASCOM*** 32K ***ORIC*** 48K ***ATARI*** 32K

DETAILS

Level 9 Computing specialise in hugh, pure-text puzzle adventures with detailed scenery and a wealth of puzzles. All games have over 200 locations and a save game feature, and cost £9.90 inclusive.

MIDDLE EARTH ADVENTURES

1: COLOSSAL ADVENTURE. A complete, full size version of the classic mainframe game "Adventure" with 70 bonus locations added.

2: ADVENTURE QUEST. Centuries have passed since the time of Colossal Adventure and evil armies roam The Land. With cunning, you must overcome the many obstacles on the road to the Black Tower, source of their demonic power, and destroy it.

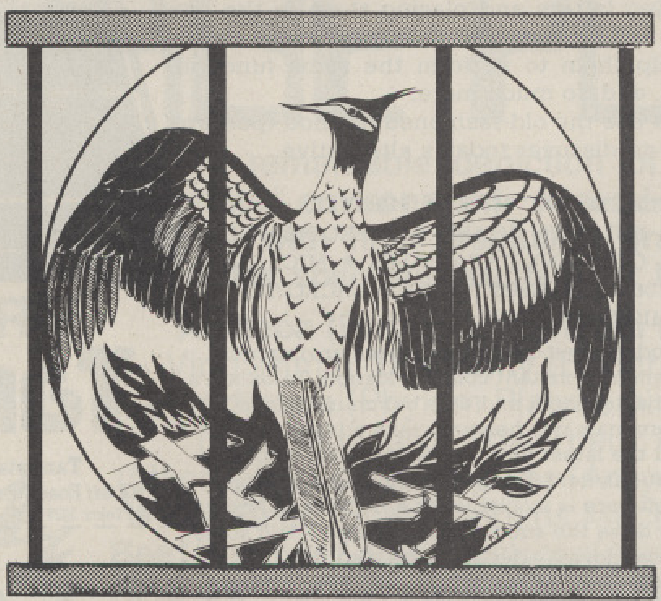
3: DUNGEON ADVENTURE. The trilogy is completed by this massive adventure, set in the rich caves below the shattered Black Tower. A sense of humour is essential!

THE FIRST SILICON DREAM ADVENTURE

4: SNOWBALL. The first of Pete Austin's second trilogy. The giant colony starship, Snowball 9, has been sabotaged and is heading for the sun in this giant game with 7000 locations.

THE LORDS OF TIME SAGA

7: LORDS OF TIME. Our congratulations to Sue Gazzard for her super design of this new time travel adventure through the ages of world history. Chill to the Ice-age, go romin' with Caesars legions, shed light on the Dark Ages. etc. etc.



Level 9 adventures are available at £9.90 from good computer shops, or mail order from us at no extra charge. Send order, or SAE for catalogue, to the address below – and please describe your micro.

LEVEL 9 COMPUTING

Dept I, 229 Hughenden Road, High Wycombe, Bucks HP13 5PG

REVIEWS

"Adventures which have a fast response time, are spectacular in the amount of detail and number of locations, and are available to cassette owners . . Simply smashing!" *– Soft, Sept 83*

"**Colossal Adventure** is included in Practical Computing's top ten games choice for 1983: "Poetic and tough as hell." *– PC, Dec 83*

"To sum up, **Adventure Quest** is a wonderful program, fast, exciting and challenging. If you like adventures then this one is for you" *– NILUG issue 1.3*

"**Dungeon Adventure** is recommended. With more than 200 locations, 700 messages and 100 objects it will tease and delight!" *– Educational Computing, Nov 83*

"**Snowball** . . As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denziens . . this program goes to prove that the mental pictures conjured up by a good textual adventure can be far more vivid than the graphics available on home computers." *– Which Micro?, Feb 84*

"**Lords of Time.** This program, writen by newcomer Sue Gazzard, joins my favourite series and is an extremely good addition to Level 9's consistently good catalogue . . As we have come to expect from Level 9, the program is executed with wonderful style – none of those boring "You can't do that" messages! Highly recommended.". *– PCW, 1st Feb 84*

NDS BIG NAME DISCOUNTS

COMMODORE 64

		R.R.P.	N.D.S. PRICE
BUSINESS			
Bank Street Writer	Disk	56.30	43.95
Household Finance	Cass	24.10	18.84
Heswriter 64	Cart	36.86	28.78
Check Ease	Cass	24.78	19.36
Multiplan	Disk	80.44	68.00
Home Accountant	Disk	60.32	47.10
EDUCATIONAL			
Early Games for Young Children	Cass	24.10	18.84
Early Games Fraction Factory	Cass	24.10	18.84
Story Machine	Cart	32.15	25.12
Facemaker	Cart	28.52	21.90
Kindercomp	Cart	24.10	18.76
Alphabet Zoo	Cart	28.52	21.90
Micro Addition/Division/ Multiplication/Subtraction	Cass	each 24.10	18.84
ENTERTAINMENT			
Choplifter	Cart	33.06	25.79
Lode Runner	Cart	33.35	25.79
Jumpman	Cass	33.06	25.79
Sargon II	Cass	28.92	22.50
Deadline	Disk	41.34	32.29
Frogger	Cass	28.92	22.57
Fort Apocolypse	Cass	28.92	22.57

☎ **Full catalogue available upon request. Phone 0892 36832/3.**

nds

Nationwide Discount Software

Plus 5%
Further Discount
and monthly
bargains for club
members only!
Membership Fee
£5 per year

To Nationwide Discount Software, P.O. Box No 28, Tunbridge Wells, Kent TN1 2YU. Tel: 0892 36832/3.
Please send me the following items:

DESCRIPTION	MACHINE	PRICE
MEMBERSHIP FEE OF £5 A YEAR		
POSTAGE AND PACKING		0.80
	TOTAL	

I ENCLOSE CHEQUE/POSTAL ORDER MADE PAYABLE TO NATIONWIDE DISCOUNT SOFTWARE READERS ACCOUNT. REMITTANCES SHALL BE HELD ON YOUR BEHALF UNTIL GOODS ARE DESPATCHED. ALL ITEMS SUBJECT TO AVAILABILITY, DELIVERY 21/28 DAYS.

NAME__________ MEM No.__________
ADDRESS__________
__________ TEL.__________

ALL PRICES INCLUSIVE OF VAT

IS POOR SOFTWARE KEEPING YOU POOR ?

TEXT64
SM SOFTWARE
CUDA64
SM SOFTWARE
KIT64
SM SOFTWARE
ISM64
SM SOFTWARE
MAE64
SM SOFTWARE
CREATE YOUR LIFE MORE SUCCESSFUL!

A good tool is worth its weight in gold.

GOLDEN TOOL

software for the 64.

TEXT64

The professional text processor with more than 80 functions to aid productivity; multi-colour display; up to 120 columns without extra hardware; search & replace; enhanced block handling; direct access to addresses in CUDA files; etc etc

ONLY £50

CUDA64

Your professional standard, personal address filing system. Direct access to 620 addresses per disk; 5 extra lines per address for comments; totally menu-driven; powerful editing and back up facilities; several hardcopy facilities.

ONLY £40

KIT64

The famous programming tool for Commodore micros. Extends BASIC – merge, find, re-number, dump, trace, enhanced floppy monitor (disk doctor), highly efficient machine language monitor with built-in assembler, disassembler, trace, and many other helpful features. A real golden tool!

ONLY £40

ISM64

This index sequential file manager gives you a new dimension on direct access file handling. Up to 40 keys, variable record lengths, simultaneous handling of 10 files. How can you program without such a tool?

ONLY £40

MAE64

The definitive tool for the would-be master of the 64. If you are ready for programming in assembler, buy it now. Not for beginners, this tool will help you to fashion masterpieces of the programmer's art. Coexists with Commodore BASIC.

ONLY £40

PLACE YOUR ORDER NOW!

If your Commodore dealer cannot supply, contact us direct. Cheque with order please. Prices include vat, packing and carriage within the UK. Allow 7 days for delivery. All programs on disk and described in detail in a manual.

Prices firm to end 1983

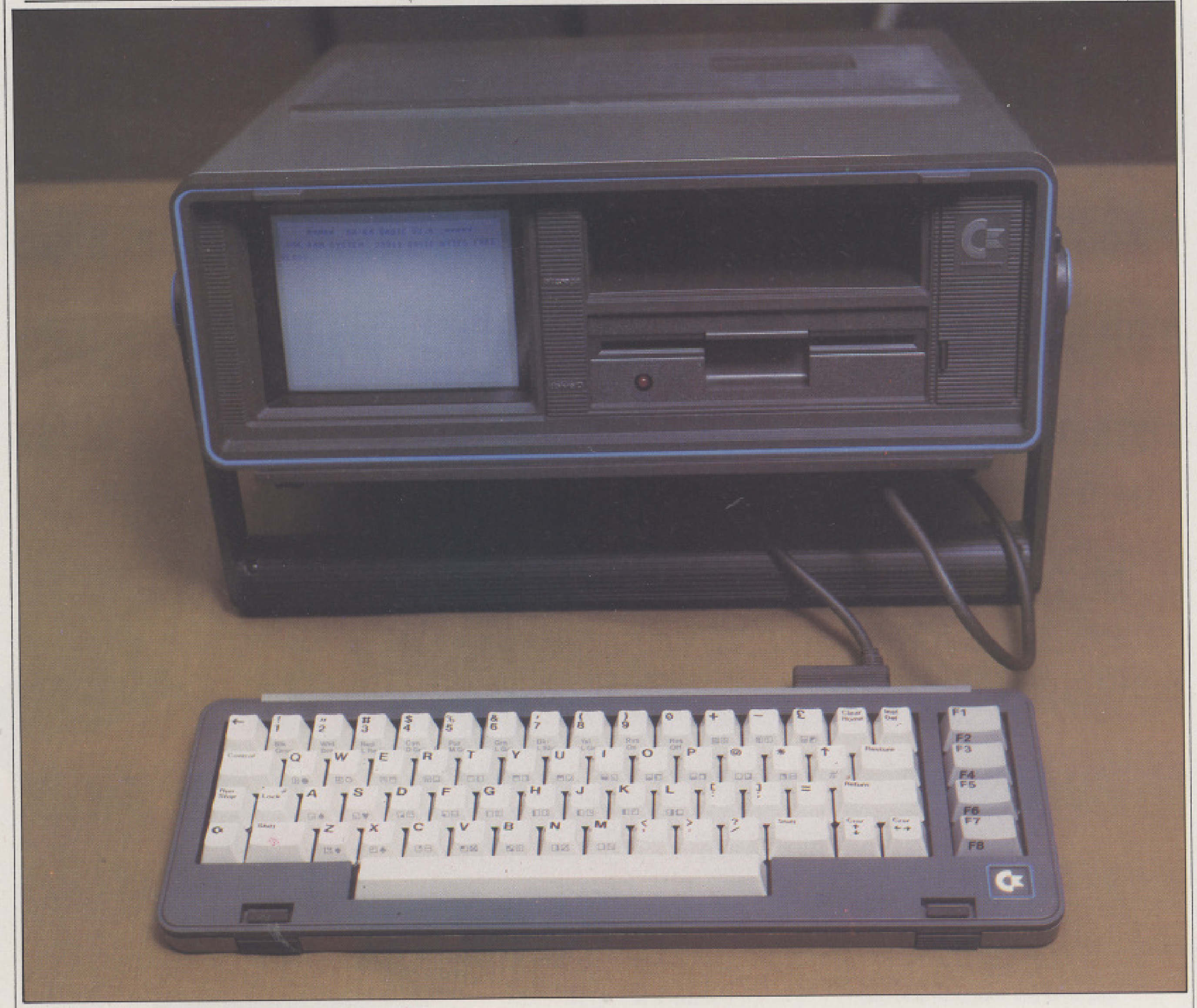
SM SOFTWARE (UK) Ltd
Raglan House, Long Street
Dursley Glos.
tele: 0453 46065 & 2101

Part of the SM Software group, supplying international software.

Dealer enquiries invited.

SX-64 REVEALED

This month we got our hands on the SX-64, the portable version of the 64, and put it through its paces to discover its good – and bad – points.



Commodore Computing Path

At last the SX-64, the portable version of the Commodore 64, has reached UK shores. It has, of course, been available in the US for some time – our thanks to those US readers who have had a chance to get used to the new machine and offered us their comments.

If you're expecting something that looks even vaguely like the full size 64, forget it. Apart from the Commodore logos here and there, at first glance there's nothing to indicate the two are even related. Those 64 enthusiasts who have developed an affection for the machine which even extends to the muddy brown colour might be offended by the dark grey colour of the SX-64.

It measures 14.5 inches square and is 5 inches deep and weighs approximately 10.5 kilograms. A carrying handle acts as a support when the computer is set up. The keyboard doubles up as a lid which covers the monitor screen and the disk drive slot. On our model we found the catches on the lid a little tricky and if you weren't careful, or on the other hand if you were a little careless, you might lose the lid. It is very simple to set up – there's just one connection between the keyboard and the main body of the computer through a 25-pin lead and apart from that all you have to do is to plug it in and switch on.

So far, so good. But now you start to encounter problems. None of the problems is, it is true, all that serious and many of them are inevitable – caused by restrictions imposed by the computer's portability. It's unfortunate that, since the 64 has already been fully reviewed, reviewers can only look at what's new about the portable. This means that many of the good points which are common to both machines get passed over while the bad points of the portable are highlighted.

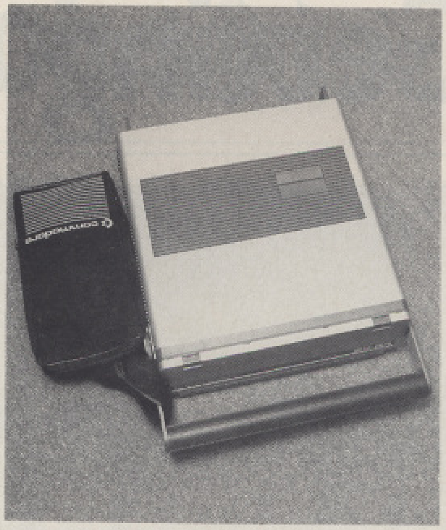
Suffice it to say that we at Commodore Computing International are great supporters of the Commodore 64 and believe there's no better computer for the price. All the advantages (and disadvantages) of the electronics of the big brother are present in the portable.

Our office desks are not noticeable for their remarkable shine but the SX-64 keyboard displayed an irritating tendency to slide around. We also found the keyboard a little less easy to use than big brother's. It's a smaller keyboard, very compact and the 67 keys appear to be slightly closer together and less steeply raked.

The 5 inch screen, although a full colour monitor, must be regarded as purely functional. It would be unwise to buy an SX-64 with the idea of using the built in monitor all the time. It's far too small for any prolonged serious use but is good enough as a temporary stop-gap.

The screen shows the standard 40 column display but it can be used as a window to handle 240 columns. The colour capabilities of the SX-64 are exactly the same as the standard 64. Colour, contrast, brightness and vertical hold are controlled by buttons located on the right of the front panel. The volume control is also found here.

The disk drive is basically a built in 1541 – a 17K, 5.25 inch floppy disk drive. What we fail to understand about the disk drive is why it interfaces in the way it does with the computer inside that nice grey exterior. Apparently the disk drive interfaces with the computer in exactly the same way that the 1541 interfaces with the big brother 64. It seems to us that an opportunity was lost here to speed up the disk drive. As everyone who owns a 1541 knows it is notoriously slow. Above the disk drive is a large slot marked storage. It's useful for storing the leads and may, perhaps, be useful for storing disks.



The SX-64, all packed up and ready to go!

At the back of the SX-64 is the usual array of two DIN plugs, an edge connector for a printer, two A-D interfaces and, of course, the on/off switch. A ROM cartridge interface can be found on top of the machine.

Where, you may ask, is the cassette interface? The answer has surprised most people – there isn't one. But the SX-64 is, after all, a business machine. The vast majority of business software is on disk. Can any business software that's on tape only and not on disk really be serious? And businessmen aren't expected to play games on their #900 computer. Unfortunately you do get the impression from the literature that the portable is a great idea because you can take it home with you the end of the day and the rest of the family can enjoy it.

While reviewing the SX-64 we began to question the whole idea of portable computers. The truly portable computers are a terrific idea. Tapping away at a keyboard on your lap in a crowded train compartment not only creates a great deal of interest (in the UK at least) it really does enable you to do work in circumstances which would usually be too inhibiting.

But there are a number of 'portable' computers which would more accurately be called transportable. They won't work without a mains supply and therefore cannot be used while you're on the move. The photographs that accompany the literature show scenes that give the impression that SX-64 is truly portable.There's a suitably macho man standing in the middle of a building site carrying his SX-64 – and not an electrical supply in sight.

Who will use the SX-64 and computers like it? And why would they buy the SX-64 rather than the big brother 64? There are obviously the people around who want the machine since Commodore say they are selling well – they had 1,500 pre-Christmas orders.

We could not come up with one absolutely, undeniable, concrete reason why the portable was a better bet for any of us than the full size version. We had this nagging feeling at the backs of our minds that Commodore had not put a tremendous amount of research and development into producing a really good portable computer. It's rather as if they said to themselves: 'Hey – what if we stick the 1541 disk drive in a box with the computer parts of the 64, then add a little monitor, copy Osborne and put a keyboard in the lid? That'll give us a nice portable without all the bother of all that research and development.'

SX-64 Modifications

We have made a comparison between the ROM's of the 64 and the ROM's of the SX-64. Following is a list of the differences between the two systems.

There are no alterations to the Basic ROM.

We have found that there are quite a few modifications to the kernal ROM however.

ADDRESS ALTERATION.

58489-58515 The Power up message has been altered to give sx-64 instead of commodore and v2.0 replaces v2.

58540 Also in power up message.

58579-58588 Added routine replacing blank memory.

58677 New Cursor colour (Blue instead of Lt. Blue).

58748-58869 Set screen pointers routine.

58863 Input from keyboard routine (branch).

58868-58869 New address for SHIFT/RUN-STOP.

58914-58915 New address for retreat cursor routine.

59911-59922 Modification to clear screen line routine.

60633-60634 New default border and screen colours.

61332-61334 Jump from routine to added routine at 58579.

61656-61670 String for SHIFT/RUN-STOP: 'LOAD ":*", 8 <ret>RUN<ret>' replaces the now useless command of '<ret>PRESS PLAY ON'.

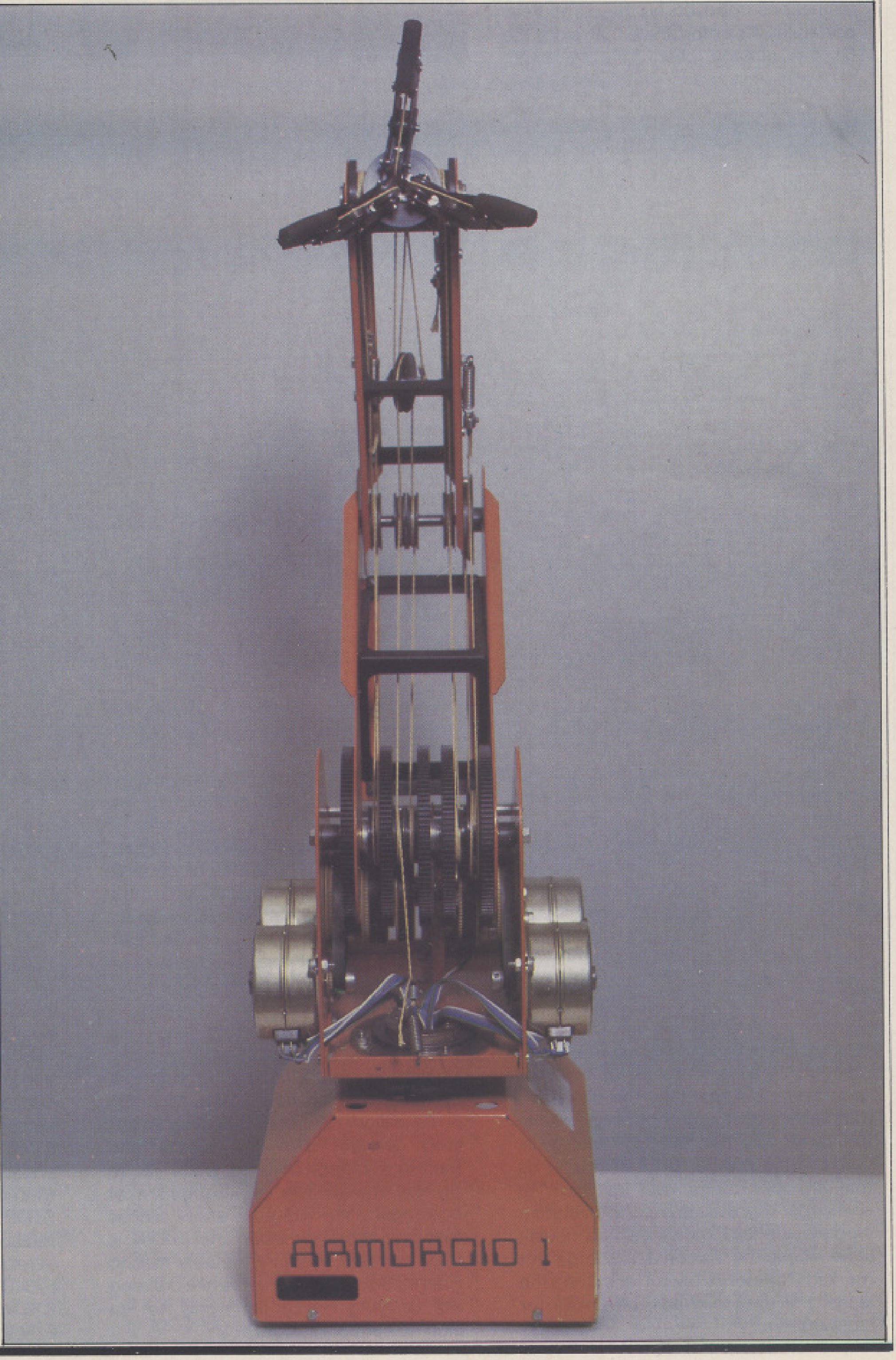
62343 Modified branch in open file.

62647 Low byte of a jar in load routine.

62969 Branch in save routine.

Getting to grips

Once every couple of months the media get hit by a massive dose of robot mania. Suddenly newspapers and TV programmes are predicting the end of manual labour for humans. The evidence for this rash prediction is usually the launch of an inordinately expensive bundle of plastic and wires that trundles around so clumsily that you'd never trust it with something as valuable as a Martini. With recent launches of robots that can be controlled by a home computer such as the 64 we thought it was time we looked at the sort of robotics that's accessible to the general public.



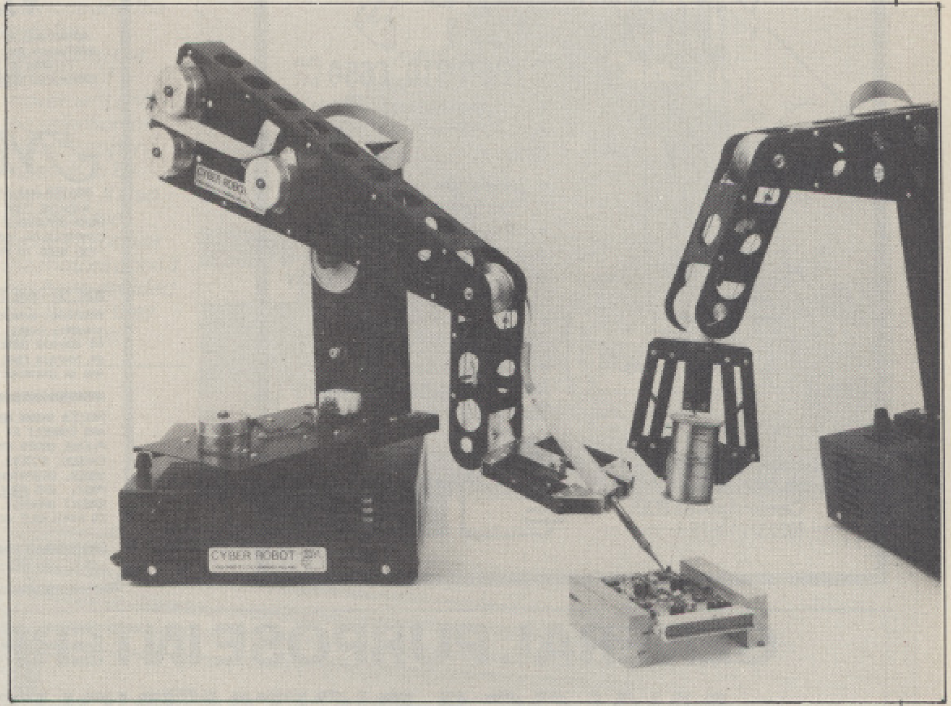
with Robotics

The public has been made aware of the current capabilities of robotics through news of manufacturers such as British Leyland using robots in the production line, and through robots used for promotional purposes at exhibitions. Even the Prime Minister recently came face to face with a robot at a conference hall where she was greeted by a bespectacled robot complete with bowler hat saying "Good morning Prime Minister, how nice to meet you."

People have also been given a tantalising futuristic look at robots through such lovable robotic characters as Star Wars hero C3PO.

Techno-fear is an expression often heard when new technology is discussed, but it wasn't the reason behind the refusal of American casino chiefs to install a robot croupier. They were worried that it could learn to cheat customers!

Many people dream of having their own personal robot slave to perform all those tedious household chores and to wait hand and foot (should that be wheel?) on them. Unfortunately it will be many years before these dreams can be realized. However, less sophisticated forms of robotics are accessible to the public. Robot arms, for instance, are an interesting introduction to the world of robotics and a number of companies are coming out with robot arms that can be driven by popular micros like the 64, at a price within reach of the general public.



Cyber Robotics' robot arm, the Cyber 310, is pictured above demonstrating the accuracy to which a robot arm can be positioned. Operating along the same principles as Colne's Armdroid, Cyber Robotics' arm emulates a full-size industrial robot. It's operating system is an extension of FORTH which permits speed control. Slow movements allow close analysis or critical control.

The brightly coloured robot arm pictured here comes from Colne Robotics and is available in kit form for around £400. Called Armdroid, it rather resembles a toy crane. It won't do the cleaning or make the tea, but it can be programmed by your computer to do simple tasks like picking up an object and moving it from A to B.

Colne Robotics' Armdroid is a relatively simple but ingenious robot arm. Perhaps it's a little beyond the pocket of the average micro owner but at around £400 for the kit it's ideal for educational purposes. Nearly everything is showing – all the cogs and gears are visible so it's easy to see how it works mechanically – and, in spite of the brightly coloured sheet metal from which the casing is made, it does look, in some respects, a little like a string driven thing. But what looks like string is, in fact, special carbon fibre, enormously strong and almost impossible to stretch.

Like most examples of robot arms this one uses stepper motors which receive the instructions from the computer. The Armdroid has five such motors and on the printed circuit board that makes up the interface, hidden at the base of the arm, there are also five chips. Each chip send instructions to one of the motors. There is also some overall control of the arm.

Stepper motors, of course, move step by step. The size of each step is predetermined and the number of steps taken depends on the amount of current applied and the period for which it is applied.

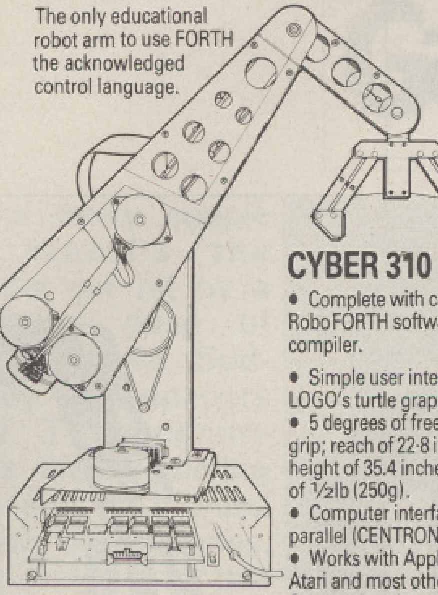
Another robot arm on the market is the Cyber 310 from Cyber Robotics. At around £650 the Cyber arm is more expensive than Armdroid and uses an extension of FORTH called ROBOFORTH. This permits individual complex motions to be learned, combined and played back allowing the user to understand what is happening without the assistance of a computer expert.

Cyber 310 has five degrees of movement, a programmable gripper action and the ability to rotate the shoulder 300 degrees in the vertical plane to operate on the opposite side with the arm upside down, giving the robot greater flexibility.

One of the major setbacks with most robots is that they cannot 'see'. Move an object a few inches away and it won't be able to find it. Dr Peter Davey has developed a robot that can see, using a laser and tiny television camera in the 'business' end of the robot. The laser provides a brilliant flat illumination so the robot is not confused by varying

The **FORTH ROBOT**

The only educational robot arm to use FORTH the acknowledged control language.



CYBER 310 £650 plus VAT

- Complete with cable, Cyber's RoboFORTH software, FORTH compiler.
- Simple user interface based on LOGO's turtle graphics.
- 5 degrees of freedom plus grip; reach of 22·8 inches; working height of 35.4 inches; lift capacity of ½lb (250g).
- Computer interface 8 bit parallel (CENTRONICS).
- Works with Apple, Pet, Acorn, Atari and most other computers. State make when ordering.

Details from

Cyber Robotics Ltd
61 Ditton Walk
Cambridge CB5 8QD
(0223) 210675

Superbase 64

TRANSFORMS THE COMMODORE 64 INTO A FULL-FEATURED AND PROFESSIONAL DATABASE SYSTEM! WITH UP TO 1000 CHARACTERS PER RECORD ON UP TO 4 SCREENS... AND UP TO 128 ITEMS PER RECORD, DEFINABLE AS KEY, TEXT, NUMERIC, CONSTANT, RESULT OR DATE... IN FILES OF UP TO 16M CHARACTERS! SUPERBASE 64 EVEN HAS SPREADSHEET AND CALCULATOR CAPABILITY, CALENDAR FUNCTIONS, EASY INPUT FROM WORDPROCESSOR/DATA FILES, BOTH MENU-DRIVEN AND PROGRAM OPTIONS, SORTING/SEARCHING, FULLY DEFINABLE OUTPUTS... SUPERBASE 64 IS ESSENTIAL IF YOU WANT THE MOST FROM YOUR 64! SUPPLIED ON CBM 1541 DISK WITH EXCELLENT TUTORIAL/REFERENCE MANUAL. OUR PRICE ~~£99.95~~ £88.00!

VIZAWRITE 64

VIZAWRITE 64 IS A HIGH-PERFORMANCE, LOW-COST WORD PROCESSOR, WITH ON-SCREEN FORMATTING, THAT TAKES FULL ADVANTAGE OF THE 64'S COLOUR, GRAPHICS AND MEMORY FEATURES... AND SUPPORTS VIRTUALLY ANY PRINTER! WITH A COMPREHENSIVE AND EASY-TO-FOLLOW USER MANUAL. VIZAWRITE IS THE ULTIMATE PERSONAL COMPUTER WORD PROCESSOR! AVAILABLE ON CARTRIDGE (~~£89.95~~ £75!), DISK (~~£79.95~~ £68!) OR WITH VIZASPELL (~~£99.95~~ £85!)

Master 64

MASTER 64 IS A TOTALLY NEW CONCEPT... A COMPLETE PROGRAM DEVELOPMENT PACKAGE, THAT'S AVAILABLE NOW FOR THE CBM 64. MASTER HAS 85 NEW COMMANDS... AND BASIC IV TOO! PLUS PROGRAMMER'S TOOLKIT, MACHINE CODE MONITOR, BUSINESS BASIC, KEYED DISK ACCESS, MULTIPLE SCREENS, USER-DEFINABLE INPUT ZONES, REPORT GENERATOR, 22-PLACE ARITHMETIC, DISK DATA COMPRESSION, DATE CONTROL, SCREEN PLOT, SCREEN DUMP, AND MORE... EVERYTHING YOU NEED TO PROGRAM YOUR 64 TO TOP PROFESSIONAL STANDARDS! (~~£143.75~~ £115!)

MORE SOFTWARE FOR COMMODORE 64:

PRACTICALC (DISK/TAPE) ...	~~£44.50~~	£41.50
VIZASPELL (DISK)	[illegible]	£49.95
DTL COMPILER (DISK)	[illegible]	£109.00
DTL COMPILER (TAPE)	[illegible]	£36.95
TOOL 64 (CARTRIDGE)	[illegible]	£46.95

SOFTWARE FOR COMMODORE PET/700:

SUPERBASE (700/8096)	[illegible]	£425.00
SUPERSCRIPT (700)	[illegible]	£425.00
SUPERSCRIPT (8096)	[illegible]	£375.00
SUPERSCRIPT (3000-8000) ..	[illegible]	£225.00
MASTER (4000/8000/8096) ..	[illegible]	£225.00

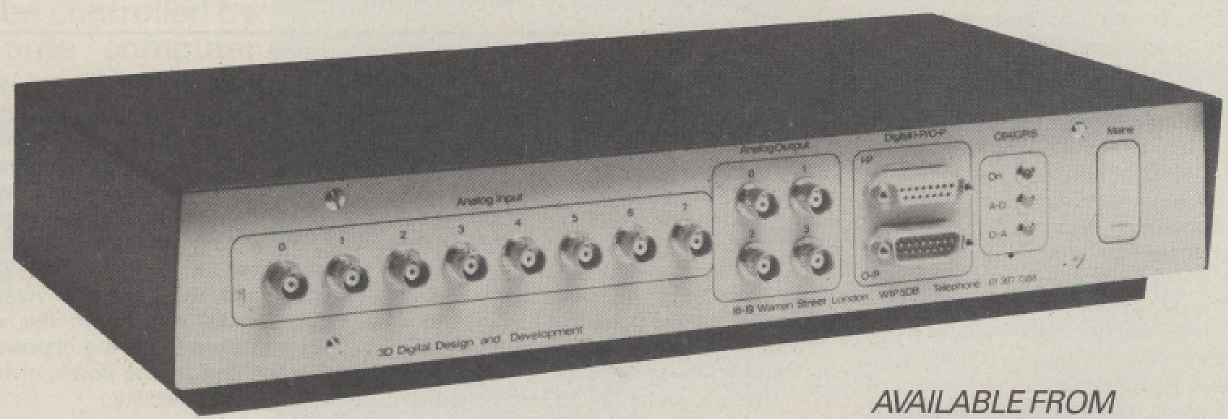
PRICES SHOWN ABOVE INCLUDE 15% VAT, AND ARE CORRECT AT TIME OF GOING TO PRESS. PLEASE ORDER BY POST OR TELEPHONE, USING CHEQUE, ACCESS, BARCLAY CARD OR OFFICIAL ORDER. DESPATCH IS BY SAME-DAY 1ST CLASS POST, AND FREE (EXCEPT FOR OVERSEAS AND CREDIT ORDERS). FULL PRODUCT INFORMATION IS AVAILABLE ON REQUEST. [REF A27]

Calco Software

LAKESIDE HOUSE, KINGSTON HILL, SURREY, KT2 7QT. TEL 01-546-7256

GENERAL PURPOSE INTERFACE SYSTEM
ANALOG & DIGITAL INPUT & OUTPUT

FOR CBM 64, APPLE II/IIE, OR BBC MICRO


Analog Input
0
1
2
3
4
5
6
7
Analog Output
0
1
2
3
Digital I/P O/P
I/P
O/P
CBM/GPIB
On
A-D
D-A
Mains
18-19 Warren Street London W1P 5DB Telephone 01 387 7388
3D Digital Design and Development

- *8-channel 12-bit analog-to-digital convertor – dual convertors, 13-bit integrating & fast (25 µs)*
- *8-channel digital power driver – can switch up to 400mA at 50v.*
- *4-channel 12-bit digital-to-analog convertor – output ranges switch selectable ± 2.5v. to ± 10v.*
- *8-channel digital input – TTL or contact-closure sensing*
- *Manual, demo diskette, and cables included*

DEALER INQUIRIES INVITED

AVAILABLE FROM

3D

Digital Design and Development Ltd.
18/19 Warren Street. London W1P 5DB
Tel: 01-387 7388 Telex: 8953742

shades. This is particularly useful in industry where the robot needs to remain on target. Davey is now programming the robot to inspect and touch up shoddy work.

There are robots on the market which do have the appearance people have come to expect from a robot. Not humanoid by any means, but with friendly looking 'faces'. They perform some basic functions, but can really only be described as a very expensive toy out of the average man's financial reach.

Prism have recently launched two personal robots, Topo and FRED (Friendly Robotic Educational Device). Topo is three foot tall and will cost you around £1,500. He (she? it?) is controlled via a personal computer or joystick. A wireless infra-red communications link relays information from the computer to Topo. Topo is capable of speech and movement, but is by no means stable enough on its feet (in this case two independentally driven wheels) to carry your drinks to you without spilling a drop.

FRED looks more like Dr Who's trusty companion K9 and, at just over one foot high, performs on a table top or on the floor.

Retailing at around £200, FRED comes complete with a portable infra-red remote control although it may also be operated via a personal computer.

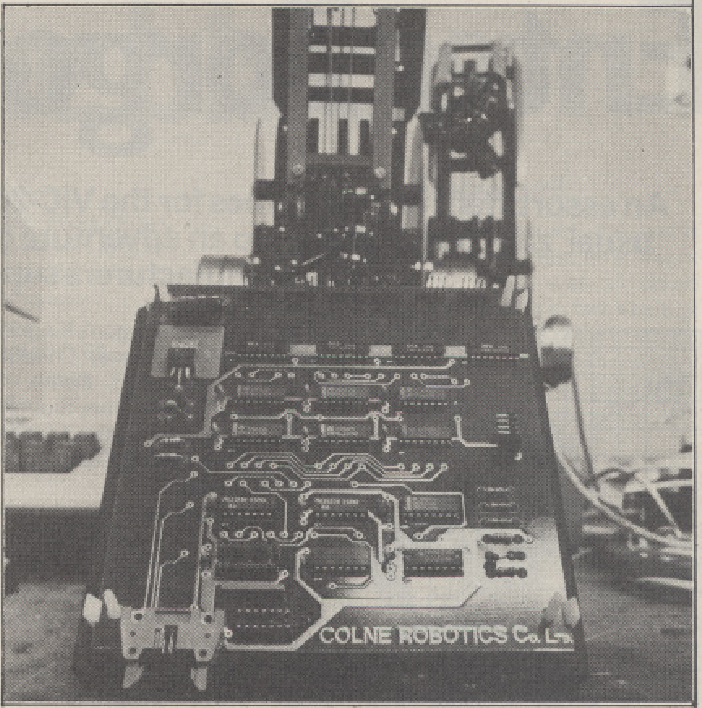
A drawing pen attachment allows the user to create patterns on a computer screen which can then be translated onto paper by FRED. Like big brother Topo, FRED can speak. A 45 word vocabulary is optionally expandable.

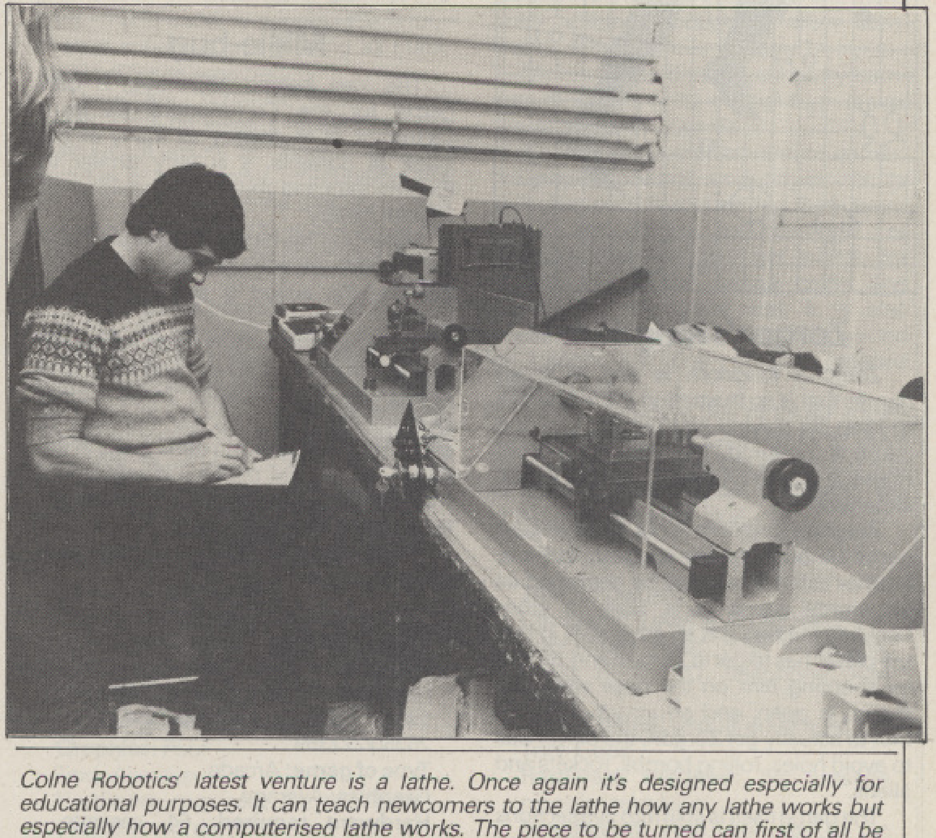
Although primarily a toy at present, Prism's plans for the future include applications such as intruder detection, smoke detection, hoovering/lawnmowing, and fetching and carrying for invalids.

Hoover have produced a remote control vacuum cleaner which is operated by a joystick similar to the ones used in playing computer games, and hope to be able to include a programming facility which will enable the machine to find its own way round the room. However, these are not likely to appear on the market just yet as even the remote control model would cost up to four times as much as the latest push-around models.

So keep dreaming about your own personal robot slave, but for now why not consider an introduction to robotics through the sort of robotics currently accessible to the public such as a robot arm.

The printed circuit board of Colne Robotics' Armdroid, pictured right, contains a user-port compatible interface and the logic for controlling the direction of movement and the selection of which stepper motor is to be activated. It also contains the drivers to power the motors once it has been decided which way they are to move.



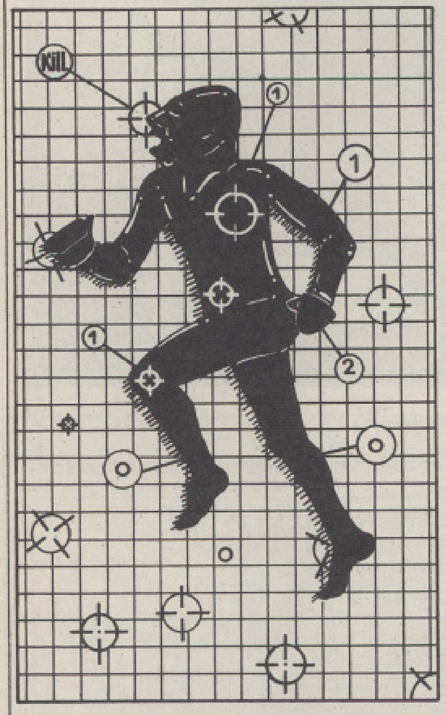


Colne Robotics' latest venture is a lathe. Once again it's designed especially for educational purposes. It can teach newcomers to the lathe how any lathe works but especially how a computerised lathe works. The piece to be turned can first of all be designed on the monitor and can be viewed as a three dimensional object. It is therefore possible to see exactly what the finished piece will look like before work starts.

The lathe is designed to interface to any parallel port 8-bit micro. The software that Colne Robotics supply provides a comprehensive range of G-codes and the facility to accept and retain complex cutting sequences. The lathe is the first in a planned range of educational machine tools.

Enter Zorgon's Kingdom

An assortment of new games for the VIC-20 and the CBM-64 this month, from the usual 'zap! pow!' variety to an adventure game rumoured to be so hard that the manufacturers supply a free clue!



Zorgon's Kingdom

Zorgon's Kingdom is one of those games that is so frustrating the player has to keep on playing and playing until the game is mastered. This new game from Romik is played on the VIC with 8K or 16K expansion.

Zorgon's Kingdom is not an adventure game although the title suggests that it is. Neither can it accurately be described as an arcade game. It is really a cross between the two. It is an adventure in that the player has to get to Zorgon and kill him by shooting him on the nose when his mouth is open, and an arcade game in that to actually get Zorgon, the player has to avoid holes, rolling bombs, rockets and aliens.

The game itself is split into five sections and, naturally, to progress from one section to the other each screen has to be completed successfully.

The graphics are quite good although the movement of the sprite is sometimes a little slow.

Title: Zorgon's Kingdom
Programmer: Chris Stamp
Company: Romik Software, 272 Argyll Avenue, Slough, Berkshire
Type of game: Arcade/Adventure
Graphics: Quite good. Movement is a bit slow
Hardware required: VIC with 8K or 16K, television or monitor, cassette player, joystick (optional)
Description:. Successfully complete the five sections of this game and kill Zorgon
Price: £6.99 including VAT, post and packaging
CCI rating: ***

Millie-bug

The idea behind Millie-bug, a new game for the Commodore 64 from Dk'tronics, is to destroy as many of the bugs as possible. It is very similar to Exterminator and imitation is the sincerest form of flattery.

Millie-bug has nine skill levels although the first five are not worth bothering with because the action is slow and rather boring.

The graphics are fairly good, especially on the introductory screen and the sound effects are quite realistic. These cannot and do not make up for the lack of excitement and speed in other areas of the game. To get the maximum enjoyment from the game the user should go straight to level nine and stay there.

The program is recorded on both sides of the cassette.

Title: Milie-bug
Company: Dk'tronics, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AX, Telephone 0799 26350/222359
Type of game: Arcade
Graphics: Average
Hardware required: 64, cassette recorder, television and a joystick
Description: Kill the catterpillars
Price: £5.95 plus 50p for post and packaging
CCI rating: ***

Snooker

Snooker is a machine code one or two player simulation game that runs on the 64. Control of the game is either by keyboard or by joystick and after the game has been loaded a check is run to see if a joystick is attached.

If there is not a joystick attached, it is assumed that the keyboard is the input medium with the cursor and the S key moving the cue and the cue ball. For firing use K.

It is possible to play a 15 or 10 ball game and the first break is made by positioning a '+' at a user defined position. This cross represents the line the cue ball will take to the target point. The actual strength of the shot is determined by the length of time the fire button is held down.

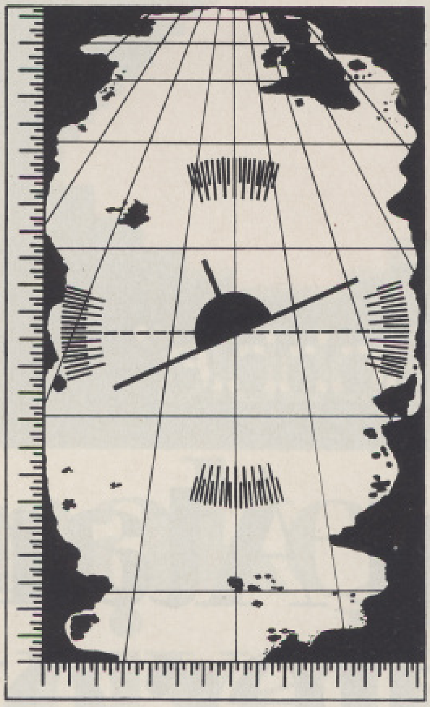
The best feature about this game is the ability to put spin on the cue ball. To do this all the player has to do is move the joystick or cursor in the direction of the spin, pressing the fire button at the same time. Release the fire button but continue to press the joystick.

Whilst putting spin on the cue ball is a very nice feature, the movement and sound of the balls leaves something to be desired. The balls often move quite slowly and when they actually touch, the sound is definitely not ivory or hard plastic. It is more like a fire cracker that has gone wild.

That is the only bad point of a game which includes all the features of a normal game of snooker and has some good hi-resolution graphics.

Title: Snooker
Company: Visions (Software Factory) Limited, 1 Felgate Mews, Studland Street, London W6 9JT
Type of game: Simulation
Graphics: Good
Hardware required: 64, cassette recorder, television and a joystick (optional)
Description: Snooker
Price: £8.95 including VAT and post and packaging
CCI rating ***

-then pot the black



Flight Simulator

The object of the Flight Simulator from Anger Productions is to fly an aircraft from Heathrow to any of eight destinations within the UK. It is a pity that more was not made of the capabilities of the 64.

In all, there are three separate screens. All of the destinations are displayed on a map of the UK which can be displayed at any time and there is a screen showing the current grid reference of the aircraft. The final screen is that of the actual cockpit and on this screen the player is presented with the compass controls and all the flight indicators.

There are three phases to this game, the first being the take-off phase where the player decides on the destination and must get the speed up to at least 130 knots. The second phase is when the aircraft is actually airborne and the user is given cockpit prompts and warnings – the worst thing that can happen is allowing the speed to fall below 60 knots which results in a fatal nose dive. When airborne, you must fly to the exact map reference before making any attempt to land.

The game makes quite an interesting diversion without being too taxing on the brain or reflexes.

Title: Flight Simulator
Company: Anger Productions, 14 The Oval, Broxbourne EN10 6DQ telephone 0992 461156
Type of game: Simulator
Graphics: Average
Hardware required: 64, cassette recorder or disk drive, television, joystick (optional)
Description: Fly the airplane!
Price: £9.95 cassette, £11.95 disk
CCI rating: * * *

Ship of the Line

Ship of the Line is a new strategy game for the 64 which takes the player back to the days of the 17th century and many naval battles in the Mediterranean.

The whole point of the game is to gain promotion from midshipman to First Sea Lord. This is done by winning the favour of your superiors and winning as many naval battles as possible.

There are, however, other factors which must be taken into account. The player must ensure that there is adequate supplies of food, water, ammunition and enough crew to man the ship. If not, the player may be forced to surrender in the middle of a battle or be murdered by his own crew.

As the game progresses, the crew of the ship gets bigger as does the supply of ammunition and enemy forces but a major disappointment in the game is the poor use of the 64's graphic capabilities. The basic screen is that of an horizon with a few clouds and enemy ships. The actual battles are graphically unexciting leaving a lot of room for improvement.

Title: Ship of the Line
Company: Richard Shepherd Software, Elm house, 23/25 Elmshott Lane, Cippenham, Slough, Berkshire, Telephone 06286 63531
Type of game: Strategy
Graphics: Poor
Text: Average
Hardware required: 64, television, cassette recorder
Description: Wage war on the high seas and gain promotion
Price: £6.50 including VAT and post and packaging
CCI rating: ***

Snowball

Anybody coming across the game called Snowball for the first time might assume that the game was all about winter sports. Snowball is in fact a textual adventure game that takes place in space. It uses a massive 32K of the 64's memory and the aim of the game is to ensure that the starship Snowball docks safely with the target planet of Eden

The big question is how do you avoid the deadly nightingales as soon as you manage to get out of the coffin?

Level 9 Computing claim that the game has well over 7000 locations and 60 objects. The budding astronaut has to solve a large number of puzzles while finding his way to the main control room and saving the starship.

The dictionary that comes with the program is limited to 200 words and this is only sufficient enough to allow commands of three or four words to be input.

Movement is dictated either by compass directions or by left, right, up, down, forwards and backwards.

Unlike many other adventure games, the player does not score any points for collecting objects and storing them away. Points are gained by progress. For example the user will get points for getting out of the freezer coffin and assembling the space suit. It is also possible to lose points if the player is killed or caught by one of the dreaded nightingales.

This is definitely one of those adventure games that will take weeks to solve and possibly months. It is so difficult that Level 9 Computing are supplying the consumer with a free clue.

Title: Snowball
Company: Level 9 Computing, 229 Hughenden Road, High Wycombe, Bucks HP13 5PG, telephone 0494 26871
Type of game: Textual adventure
Text: Good
Hardware required: 64, cassette recorder, television
Description: Find your way to the main control room and save the starship
Price: £9.90 including VAT and post and packaging
CCI rating: ***

"Gobble"
"Gobble"

Now that Atari your computer, ou a ghost of

Forget ghostly imitations. They need not darken your screens a moment longer.

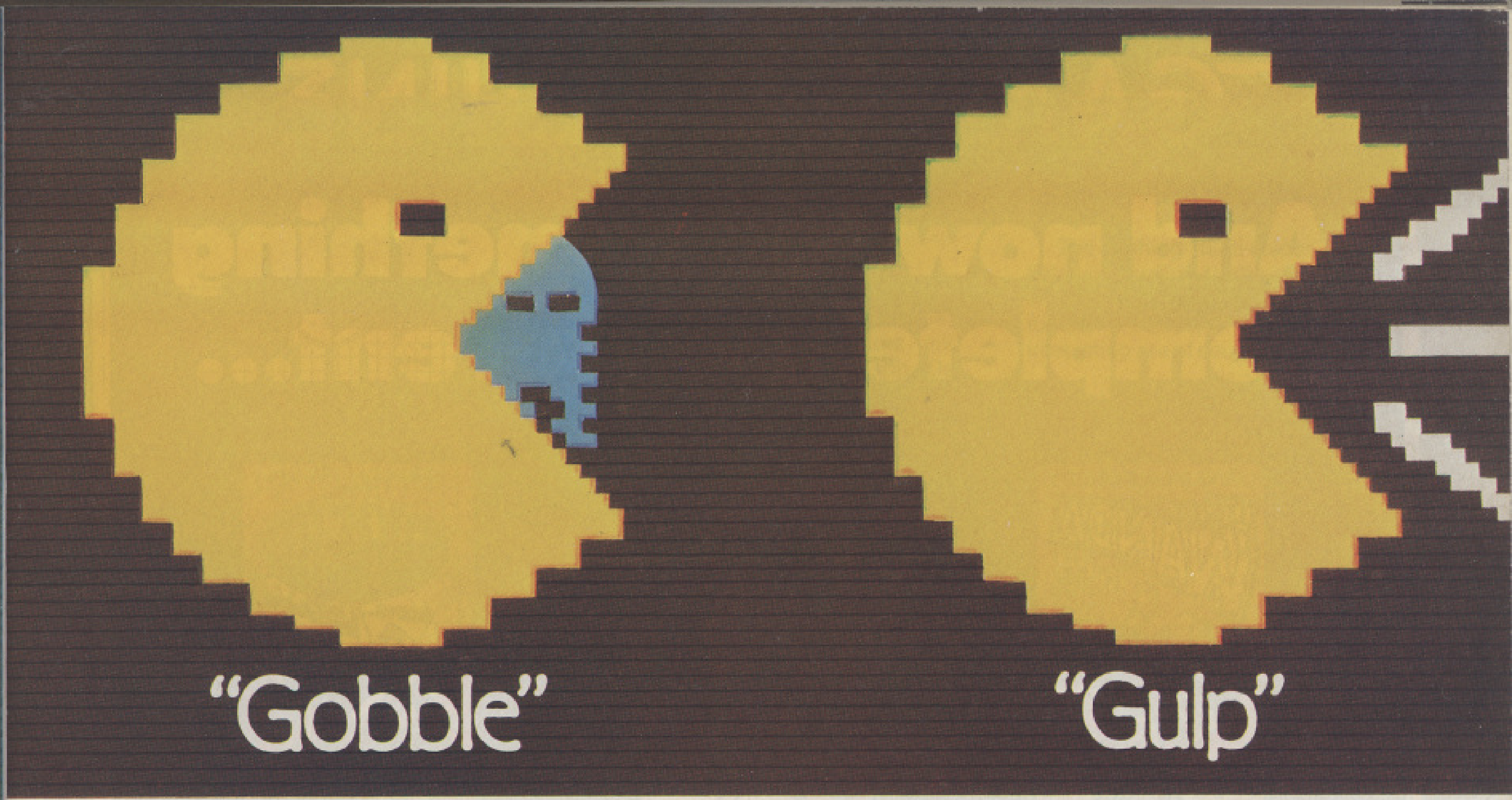
Because now you can play Atarisoft™ games on your own home computer.

Pin-sharp graphics, quick slick movements – games that really challenge your skills.

Games so close to our originals, it's like having an "Amusement Arcade" in your own living room.

SINCLAIR ZX SPECTRUM: ALL AVAILABLE ON CASSETTE. OUT NOW – PAC-MAN,† MS PAC-MAN,† GALAXIAN.‡ OUT SOON – DONKEY KONG,* DIG DUG,□ POLE POSITION,△ MOON PATROL.◇ **B.B.C. MODEL 'B'/ACORN ELECTRON:** ALL AVAILABLE ON CASSETTE. OUT SOON – MS PAC-MAN,† DONKEY KONG,* DIG DUG,□ POLE POSITION,△ BATTLE ZONE.® **COMMODORE VIC 20:** ALL AVAILABLE ON ROM CARTRIDGE. OUT NOW – PAC-MAN,† DONKEY KONG,* DIG DUG.□ OUT SOON – MS PAC-MAN,† GALAXIAN,‡ POLE POSITION,△ JUNGLE HUNT,▽ MOON PATROL,◇ STARGATE,◇ JOUST.◇ **COMMODORE 64:** ALL AVAILABLE ON ROM CARTRIDGE. OUT NOW – PAC-MAN,† DIG

† PAC-MAN, MS PAC-MAN AND CHARACTERS ARE TRADEMARKS OF NAMCO LTD. ‡ TRADEMARK OF NAMCO LTD. * TRADEMARK AND © NINTENDO OF AMERICA INC. 1982, 1983. □ DIG DUG IS CREATED AND DESIGNED BY NAMCO LTD, MANUFACTURED UNDER LICENSE BY ATARI INC. △ TRADEMARK AND © NAMCO


"Gobble"
"Gulp"

make games for
r rivals don't stand
a chance. We've written the programs to suit your computer's exact requirements.

Look at our extensive range of titles. We will be adding to this list so that you can expand your library of Atari games. After all why choose a ghost now that you can have the real thing?

PAC-MAN
SINCLAIR ZX SPECTRUM
DONKEY KONG
B.B.C. - Model B Acorn Electron
DEFENDER
TI99/4A
DIG DUG
COMMODORE VIC 20
CENTIPEDE
COMMODORE 64
FROM ATARISOFT

DUG,□ ROBOTRON,◇ CENTIPEDE,™ DEFENDER.◇ OUT SOON – MS PAC-MAN,† GALAXIAN,‡ JUNGLE HUNT,▽ MOON PATROL,◇ POLE POSITION,△ STARGATE,◇ JOUST.◇
TI 99/4A: ALL AVAILABLE ON ROM CARTRIDGE. OUT NOW – PAC-MAN,† DONKEY KONG,* DIG DUG,□ ROBOTRON,◇ CENTIPEDE,™ DEFENDER,◇ STARGATE.◇

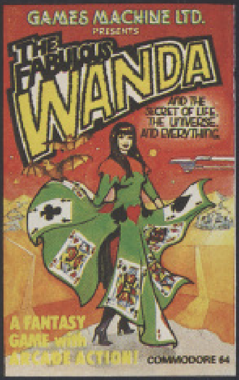
For further information, write to Atari International (UK) Inc., P.O. Box 407, Blackhorse Road, London SE8 5JH.

ATARISOFT™

1982. ▽TRADEMARK AND © OF TAITO AMERICA CORP. ◇ TRADEMARK AND © WILLIAMS ELECTRONICS INC. 1982. ™TRADEMARK OF ATARI INC. ® ATARI AND DESIGN, BATTLE ZONE, REG U.S. PAT AND TM OFF.

GAMES MACHINE

And now for something completely different...


GAMES MACHINE LTD.
PRESENTS
THE FABULOUS WANDA
AND THE SECRET OF LIFE THE UNIVERSE AND EVERYTHING
A FANTASY GAME with ARCADE ACTION!
COMMODORE 64

THE FABULOUS WANDA AND THE SECRET OF LIFE THE UNIVERSE AND EVERYTHING

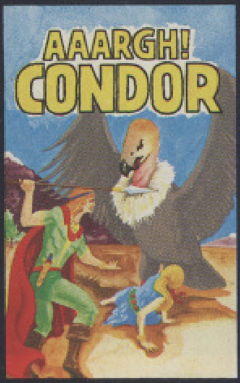
An adult fantasy game with Arcade Action

You are travelling far from home looking for good times around the Universe, when you are intercepted by the evil Brutus of the Federation. Brutus forces you to go and seek the Secret of Life, the Universe and Everything - known only to the Fabulous Wanda, a hostess in the Spaced-Out Inn in Highsville on the planet COPUS. You are teleported down to Highsville where the Customs man demands money for Teleport Tax.

There is a video game in the Terminal with 3 credits left.

Now you are on your own and you must decide how to proceed to Highsville Mainstreet to find the various establishments to enter and . . . . .

£7.95



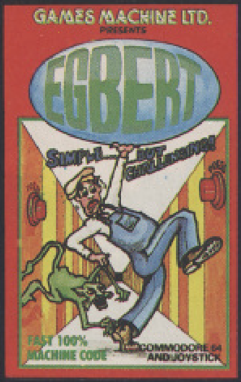
AAARGH! CONDOR

George falls into a day-dream whilst sitting comfortably in his armchair smoking his pipe.

A scene floats in front of him of a landscape with trees and a mountain in the background. A damsel lies helpless having fallen down the mountainside. A strange vulture-like bird is flying down to seize the damsel and carry her off. The damsel is now becoming hysterical and frantic with fear - George knows what he has to do . . . . .

George at once becomes the hero but he has many hazards to overcome including deadly arrows from the local warrior, deadly creatures and eggs carefully aimed from the air. Can George make it to the top of the mountain to take the spear and kill the bird? *Will George finish the game before he drops his pipe and burns the house down?!*

£7.95



EGBERT

A fast Arcade Action Game for all the family to play. Written in 100% Machine Code for super-fast action!

Egbert works on the production line at 'LEYSPACE'. It was a comfortable life until the invasion of the TEBBITES from the planet TOR. Egbert's union has been exterminated and the Tebbites have left their deadly Pets running wild in the workplace. As if that wasn't enough, the evil invaders have forced Egbert to take care of an Egg - damaging the Egg will have fatal consequences for poor Egbert. Egbert is now on piecework - can he earn a decent wage? Can he even survive? *WARNING!* You may get an ulcer by playing this game.

SIX LEVELS OF SKILL.

ANYBODY WHO CAN DO LEVEL 6 SHOULD WRITE AND LET US KNOW!

£7.95

New and original games for the COMMODORE 64

Also available soon games for STACK LIGHT RIFLE

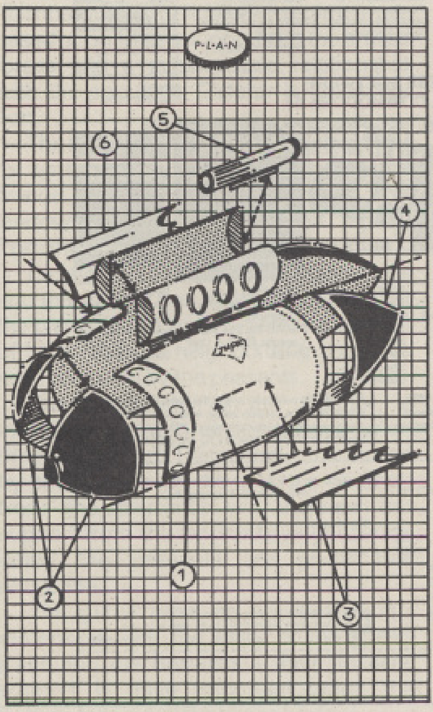
GAMES MACHINE LTD.
Business and Technology Centre, Bessemer Drive, Stevenage, Herts. SG1 2DX
Telephone: (0438) 316561 Telex: 825824

Please add 50p to cover post and packing.
I enclose a cheque/P.O. payable to GAMES MACHINE LTD., for £ ____________
or debit my Access/Barclaycard account no. ____________
Signature ____________
NAME ____________
ADDRESS ____________
____

	QTY.	£
WANDA		
CONDOR		
EGBERT		
TOTAL		

SEND TO:-
GAMES MACHINE LTD.
FREEPOST
STEVENAGE
HERTS. SG1 2YH

DEALERS AND DISTRIBUTORS REQUIRED. GAMES AND EDUCATIONAL PROGRAMMES WANTED FOR ANY HOME COMPUTERS.



Jetpac

Imagine being transported to the outer reaches of the galaxy, being the richest person in the universe and a chief test pilot for the Acme Interstellar Transport Company. If you can imagine you could probably play Jetpac well.

This is a new game for the VIC with 8K expansion. The aim is to asssemble a number of rockets on several planets, collect priceless treasures and destroy as many aliens as possible.

The ship is initially divided up into three sections, each section being located at different parts of the planet, which the player reaches using the latest Hydrovac Jetpac. Once the rocket has been assembled and refuelled all the player has to do is enter the spaceship and then . . . liftoff! The player is transported to another planet where the task is exactly the same.

Control of the realistic looking astronaut is either via the keyboard or joystick, enabling the player to moonwalk and hover in mid-space. The graphics and sound effects are quite good considering the game is for the VIC and not the 64.

This is a one or two player game, with the number of lives left, high score and individual score being recorded at the top of the screen.

Title: Jetpak
Company: Ultimate Play The Game
Address: Ashby Computers and Graphics Ltd., The Green, Ashby-De-La Zouch, Leicestershire LE6 5JO telephone 0530 411485
Type of game: Arcade
Graphics: Fair
Hardware required: 8K VIC, television, cassette player, joystick (optional)
Description: Travel the stars, assemble spaceships and gather the treasure
Price: £5.50
CCI rating: * * *

Pedes and Mutants

The instructions to Pedes and Mutants are a little bit difficult to read but well worth preservering with. It is a new game for the unexpanded VIC from Romik and after reading the description provided on the cassette cover the game sounds like an ordinary 'shoot-the-aliens' creation.

This is exactly what it is but with some noticeable differences – and what differences they are! The game is split into two parts although there is no great difference between the two. The whole object of the game is to get as many points as possible although the action is so fast the player cannot tell exactly what is being hit or, for the first few games, what scores how much.

In the first part of the game the laser cannon is not stuck to the base of the screen but is positioned close to the top with the Pedes moving quickly towards it. To kill the Pede (which is worth 1000 points) it has to be shot about 10 times. There is so much happening and the action is so fast, the player has to keep moving and firing. Pedes are not the only aliens that have to be destroyed because fleas and ants make an appearance as well.

It is not until all the six Pedes have been destroyed that the player can progress onto the second screen. In this section of the game, the laser moves like an upside down pendulum and all the mutant invaders must be destroyed. Should one escape unharmed, the player will be back to square one on screen one.

Bonus points are awarded for destroying landing bases and motherships and an extra life is awarded at 10,000 points. The beginner to this type of game will be thankful for the choice of skill levels and for the fact that the action can be held.

The flashing multi-colour screen is a little aggravating to the eyes but on the whole the graphics are good with excellent explosive effects and some interesting use of sound effects.

Title: Pedes and Mutants
Programmer: Pete Bradley
Company: Romik Software, 272 Argyll Avenue, Slough, Berkshire
Type of game: Arcade
Graphics: Good
Hardware required: Unexpanded VIC, television or monitor, cassette player and a joystick (optional)
Description: Get as many points as possible by destroying the aliens
Price: £6.99 including VAT
CCI rating: ***

Jackpot

Mr Chip, who designed the excellent game Westminster (see volume 2 number 7) have now brought out two versions of the fruit machine simulation game Jackpot. One is for the VIC and the other is for the 64 and both are written in machine code.

There are some minor differences between the two versions. With the VIC version the player gambles with pennies rather than pounds and the layout of the screen is slightly different. Obviously, the 64 has much greater graphic facilities and these are used to their full extent. The excellent graphics are not hi-res but user defined character graphics!

On the 64 it is possible to reach a maximum total of 250. To reach the maximum total on each game there are several features. Whenever the player wins there is the option to gamble, the maximum and minimum amount available being highlighted by flashing lights.

On the VIC version there are no numbers by the side of the fruit, the number of nudges being determined by the response of the player to the nudge panel at the bottom of the screen. On the 64 version, the number of nudges relates directly to the sum of the numbers to the right of the fruit. If this total is equal to seven the shuffle win comes into play. With this feature the reels spin a random win of 3 or 5.

When the number of nudges has been assessed, another handy feature is autonudge which is accessed by the function keys. Autonudge is only available on the 64 and means that the micro will automatically nudge the reels to the best available win with the available nudges.

Excellent use of graphics and colour.

A great line up of I7 NEW titles... direct from CANADA

FOR ZX81, SPECTRUM, VIC 20, C64, ATARI!

Just run your eyes over these new titles now available through "SOFTCHOICE LTD" the U.K. subsidiary of the well-known Canadian Software House HOWARD GLADSTONE ELECTRONICS INC. Purchase with confidence superb EDUCATIONAL, UTILITY and GAMES SOFTWARE!

EXCITING NEW GAMES FOR FAMILY FUN AND LEARNING FOR ZX81 and SPECTRUM

T/S1500
adding
16K T/S1000 ZX81 16K

ADDING MACHINE
Additional facts for ages 5-9 yrs.
For Spectrum.
Cassette £6.95

S1000
16K
TAKE AWAY ZOO
ZX81
16K

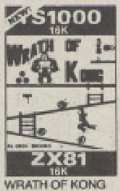
TAKE AWAY ZOO
Subtraction facts for ages 5-9 yrs.
For Spectrum.
Cassette £6.95

S1000
16K
TINY LOGO
ZX81
16K

TINY LOGO
The key to understanding and learning real computer programming!
For ZX81.
Cassette £5.95

S1000
16K
SIGNALS
CODE
MORSE
SEMAPHORE
ZX81
16K

SIGNALS & CODE
See and hear the letters and numbers in order! On demand, randomly, in messages, in score tests! For ZX81.
Cassette £4.95



WRATH OF KONG
Only great agility and cunning will outwit Kong - Climb quickly or Jane will perish!
For ZX81 & Spectrum.
Cassette £5.95

T/S1500
SPEED SNAKE
16K T/S1000 ZX81 16K

SPEED SNAKE
Slither around mazes. 10 different mazes to challenge your skill! Deadly!
For ZX81.
Cassette £4.95

T/S1500
16K T/S1000 ZX81 16K

MR MUNCHEE
Race through 3 mazes, avoid the Trolls! Exciting action with graphics!
For ZX81.
Cassette £4.95

SOFTCHOICE

SOFTCHOICE LTD.
52 PLATTS LANE, LONDON NW3 7NT.
TEL: (01) 431 2494. TELEX: 923753

CHILDRENS' & HOME EDUCATIONAL GAMES for the VIC 20, COMMODORE 64, ATARI 400/800 DISKS Only, at £14.95 each incl.

NEW
ALPHABET FACTORY

THE ALPHABET FACTORY
Two arcade-style games that teach children the alphabet!
Ages 3-8 years.

NEW
MATCH UP

MATCH UP
These high interest games make learning to read fun!
Ages 3-10 years.

NEW
WORD BIRD

THE WORD BIRD
Three different games each designed to increase a child's reading vocabulary!
Ages 3-10 years.

NEW
TIME ZONE

TIME ZONE
Two activity games that develop the needed language skills for successful reading!
Ages 3-10 years.

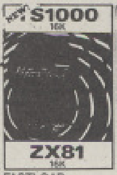
T/S1500
BRIDGE
16K T/S1000 ZX81 16K

BRIDGE
For all the family.
Sharpen your skills with the computer's bidding!
Cassette £9.50

GREAT UTILITY AND BUSINESS SOFTWARE for ZX81, SPECTRUM, VIC 20, COMMODORE 64, ATARI

NEW
FASTWORD

FASTWORD
Fast, versatile and complete word processing package by Dr Pearson.
For ZX81.
Cassette £7.50



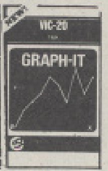
FASTLOAD
Learn any programme up to 6 times faster than normal! By Dr G. Pearson.
For ZX81.
Cassette £7.50

NEW
SINCLAIR
The Computerized Diet

DIET
Gain control over your eating patterns. By Dr M. Minsky.
For ZX81 & Spectrum.
Cassette £5.95

NEW
CALC-PRO

CALC-PRO
A great tool for home or business!
For VIC 20, C64, Atari.
Cassette £9.50 + Disk £14.95



GRAPH-IT
An easy to use tool to produce graphical displays.
For VIC 20, Atari.
Cassette £9.50

HOW TO ORDER. BY TELEPHONE (01) 431 2494
If you are a Barclaycard or Access holder, please telephone and give your Card No., Name, Address and item required for immediate despatch.

BY POST. To purchase any of the items listed above, simply fill in the coupon below, write your Name, Address, enclose your cheque or P.O. made payable to: SOFTCHOICE LTD and post to us.

Post to: SOFTCHOICE LTD.
52 PLATTS LANE, LONDON NW3 7NT
Please send me the following items:
(Use separate sheet if space allocated not sufficient)

NO. REQ.	TITLE	TOTAL COST
		£
		£
		£
		£

I enclose my cheque/P.O. for £ ....

I prefer to pay by ACCESS/BARCLAYCARD
(Delete which ever is not applicable)
Card No. ....
Signature ....
Name ....
Address ....

Please allow 7 to 14 days for delivery
Card holders' address must be the same as coupon

CCI 3/84

CBM 64 & VIC 20 CENTRONICS PRINTER INTERFACE VICSPRINT 2064

VICSPRINT 64

- *** A smart cartridge which plugs into the user port of either the CBM 64 or VIC 20, with a cable connecting the serial IEEE port on disc drive or computer plus a ribbon cable with 36 way centronics plug to plug into your printer.
- *** Looks like 'standard' CBM 64 or VIC 20 printer (without graphics).
- *** Leaves cartridge port free for cartridge based software.
- *** Totally 'system software transparent' (try using a ribbon cable adaptor with 'Vicwriter').
- *** Works with 'Easyscript', 'Practicalc' etc. and a large range of printers including Juki 6100, CP80, Gemini 10X etc., etc.
- *** TWO YEAR GUARANTEE As manufacturers of this product we can offer a guarantee of two years with the utmost confidence.
- *** Please confirm your requirements and suitability with us before purchasing.
- *** Ribbon cable version available price £17.50 inc. VAT (£1 P&P) works with several packages but requires software adaptor tape to do listings etc., (£7.95).
- *** Overseas price (£43.43) add £3 P/P, or £1 for B.F.P.O. orders.
- *** AVAILABLE FROM THE MANUFACTURERS:

£49.95
INC. VAT **(£1 P&P)**

SMITH CORONA TP1 PLUS VICSPRINT 2064
ONLY
£299.00
INC. VAT **(CARRIAGE £7.50)**

RAM ELECTRONICS (FLEET) LTD., (CCI)
106 FLEET ROAD, FLEET, HAMPSHIRE GU13 8PA
Telephone: (02514) 25252.
Callers welcome Monday to Saturday (closed Wednesday)
Send cheque or postal orders or pay by VISA or ACCESS.

IDEAL FOR WORD PRO PRINTING, ETC.

Dictator

In Dictator, the player is placed in charge of a small banana republic called Ritimban. Many dictatorial regimes are based upon large support from the armed forces and a questionable relationship with the populace. Dictator is no exception.

The aim of the game is to stay in power for as long as possible by retaining the favour of the army, secret police and landowners and siphoning off money from the State into a Swiss bank account.

Dictators will often get assassinated and this is only one of the difficulties that the player has to avoid. There is the threat of invasion from neighbouring countries and revolution by the peasants.

The popularity of the dictator is indicated by several circles that appear on the police report. This report is influenced by the actions of the dictator. Support from the peasants will increase but support from the landlords will decrease when the peasants are given free education.

The game takes on an international dimension with the entry of the Americans and the Russians – their financial support is quite important when the bottom falls out of the banana trade!

This game is based completely on text and has practically no graphics at all which is surprising because the game is for the 64. Surely some improvements can be made in that area? Despite this, Dictator is an interesting and enjoyable game.

Title: Dictator
Company: Dk'tronics, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AX. Telephone 0799 26350/22359
Type of game: Strategy
Graphics: Poor
Text: Average
Hardware required: 64, television, cassette recorder
Description: Stay in power for as long as possible
Price: £5.95 plus 50p for post and packaging
CCI rating: ***

Megawarz

Travelling from Pluto to Earth is your mission in this game from Paramount Software. Between each planet, a group of aliens is waiting to ambush you and these have to be destroyed before you are allowed to continue to the next planet.

The aliens, instead of firing at you, simply have to touch you to ensure your annihilation and what's more are virtually indestructable. The only way you can progress on your mission is to wait for an alien to recharge its force field. Luckily you can see when this is happening as the alien, which is constantly changing colour, changes briefly white. It is in this brief period that you have the chance to destroy it.

This is the scenario in this very professionally put-together shoot-em-up game. Your ship, joystick or keyboard controlled, is thus involved in a delicate cat and mouse game where you must keep close to the aliens to blast them, but far enough away for sudden changes of direction not to have you running into them.

Many other ships seem to have failed to get through as occasionally the body of an astronaut floats through the screen. These are well worth picking up for bonus points and to recharge your shield which allows an alien to pass through you without damage but at great expense to your energy reserves.

After each wave of aliens has been cleared, a bonus screen with several astronauts drifting about gives you a chance to refuel. On this screen, however, if you miss picking any astronauts up, they mutate in to particularly nasty aliens. Having survived this screen there is a delightful graphical trip to the next planet, which gives you time to catch your breath ready for the next onslaught. Of its kind a great game, and good value for money.

Name: Megawarz
Programmer: Jason Benham
Company: Paramount Software, 67 Bishopton Lane, Stockton, Cleveland.
Type: Arcade
Graphics: Good
Price: £7.50
CCI Rating: ****

Golf

Archdale Golf Club is an 18 hole par 72 course. You are asked to provide your handicap, and to admit to the worst feature of your game before beginning your round. Each hole is drawn randomly, and the distance to the hole and its par are given. At each stroke of the ball you have 13 clubs to choose from, each club will hit the ball a different distance.

All the expected hazards are presented, heavy rough, trees, bushes and the occasional stream are all to be avoided. When you are on the green, a seperate display shows your ball in relation to the flag.

After getting around the 18 holes, your score has to be entered, and an appropriate comment on your performance is given.

This game was a disappointment, the graphics were all standard Commodore keyboard characters, and the game looked as if it were on an unexpanded VIC rather than a 64. Your control over the ball's direction is minimal, you merely have the option to fade or draw (whatever that means). There is no animation of the main screen and the ball simply disappears when struck by an invisible golfer, and reappears somewhere else. The program seems to have been written in very basic Basic as the delay between taking a shot, and the screen reporting back that you are 'on the fairway' or whatever is not inconsiderable. The most skilful stage is on the green where you have to judge how hard to hit the ball, but a white blob jerking along a featureless black line to a stationary flag doesn't exactly make for a great evenings entertainment.

Name: Golf
Programmer: Ian Green
Company: Anger productions, 14 The Oval, Broxbourne EN10 6DQ
Type: Arcade/Simulation
Graphics: Poor
Price: £ 7.50
CCI Rating: *

Ludo

A competent and accurate program true to the original game in every way. There is a nice touch about the dice as they are shaken in a 'hand' rather than just being dots flickering in a box as they mostly seem to be.

From one to four players can take part although there is no option to play against the computer. Obviously a great deal of thought has gone into this program, unfortunately putting a boring game onto a new computer does not stop it from being a boring game.

This was a review sample only so maybe it will appear as one of a compendium of games for the 64, in which case there may be some purpose to it. Anyone for computer tiddleywinks?

Name: Ludo
Programmer: CP White
Company: C P White (Computers & Software), 52 Northfield Avenue, West Ealing, London W13 9SY.
Graphics: Average
CCI Rating: *

A Living Legend

On January 13 Jack Tramiel resigned as president, chief executive and board member of Commodore. Tramiel has been the driving force behind Commodore for so long now that his resignation caused more than a few raised eyebrows. After all, to many in the business, Tramiel IS Commodore. Not any more. He will, we are told, continue as a consultant to the company. But nobody seems completely convinced that this is the end of the matter. Here we take a look at Tramiel, the man, and Tramiel the father of Commodore. How did he give birth to Commodore and what's it been like bringing up the child?

Jack Tramiel

All the cliches you can possibly think of – small beginnings... little acorns – apply to Jack Tramiel. He was the soldier at Fort Dix who repaired the US army's broken typewriters. After leaving the army he used his army experience and set up his own typewriter repair business in New York's Bronx.

The groundwork for Commodore was laid in the mid-1950's when Tramiel moved with his family to Toronto following the first of many successful business deals. It was around this time that Tramiel was developing the business skills which were to prove so useful later. The deal that took him to Toronto was a licence he negotiated with Czechoslovakia to assemble typewriters.

Although an entrepreneur himself Tramiel was a great believer in cutting out the middleman. It was this logic which led him to take over a typewriter manufacturing concern in Berlin. Why sell someone else's typewriters when you can sell your own?

Another of Tramiel's policies that led to his success is in keeping his ear to the ground. At this time he was quick to spot the growing trend for low-price mechanical adding machines flooding in from Japan and accordingly moved into the mechanical adding machine business.

In 1962, the company was of a sufficient size to go public, as Commodore Business Machines, Canada, with Tramiel as President of the company.

The longstanding team of Tramiel and Irving Gould came about after a scandal involving Tramiel's first Chairman, C Powell Morgan. Morgan was condemned by a Canadian Royal Commission Investigation in 1965 for 'his defiance of all accepted business principles' and for his acts of 'repacious and unprincipled manipulation.'

Tramiel was not indicted by the Commission, although the scandal did make bank financing hard to come by. It was at this time that a Canadian investor, Irving Gould, agreed to buy a large stake in the company and to become its Chairman.

Under pressure from Japanese imports, Tramiel visited Japan to get first-hand experience of his company's opposition. Here he saw the new electronic desk-top calculator and foresaw the end of high volume sales of mechanical adding machines.

He switched Commodore computer's strategy and when the first electronic pocket calculator appeared it was Commodore who took it to market.

Direct competition between suppliers taught Tramiel not to rely on outside suppliers for key components. Gould came to his rescue again personally guaranteeing a $3m loan, giving the company the buying power to purchase MOS Technology, then a struggling manufacturer of calculator and other semi-conductor chips. This was followed by the acquisition of Frontier, manufacturers of C-MOS chips, and MDSI, a liquid crystal display manufacturer.

The acquisition of MOS Technology gave Tramiel more than just experience in a key technology. It also gave him Chuck Peddle, the engineer who is reported to have told Tramiel to forget about hand held calculators and go for desk top computers. In line with one of Tramiel's favourite mottos 'Commodore is geared to giving consumers products they don't yet know they need,' he instructed Peddle to build a desk top computer. And so the PET was born.

The PET met with an enthusiastic response and as demand grew, Tramiel again decided to leave out the middle man and went direct to big retail chain stores. After the PET, of course, came the Vic-20 and the Commodore 64. And, as they say, the rest is history.

Tramiel's decision to resign 'for personal reasons' coincides with a record trading year for Commodore, with the company becoming the first microcomputer company to report sales of over $1bn in one year, more than doubling the previous year's sales. Speculation that Tramiel's decision to resign was not entirely of his own choosing has been denied by Commodore's Software Manager, Gail Wellington, who said: 'Tramiel is just tired. Last time I saw him he was having breakfast with Mr Smith (his successor) and I've never seen him looking so happy.'

And an interesting thought to end with. This is not the first time Tramiel has resigned. In 1982 he resigned his position but took it up again in a very short period of time...

Computerama 64

the source

QUICKSHOT II
Deluxe Joystick Controller

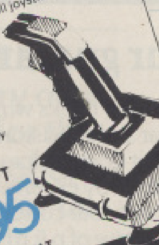
NOW WITH RAPID FIRE FEATURE

The latest version of this most popular of all joysticks

- Robust, Accurate & Responsive
- BETTER MADE For longer life
- Long cord & TOUGH moulded plug
- Self-centring Joystick at an unbeatable price
- TWO Fire buttons – for maximum control & comfort
- PISTOL GRIP – comfortable over many exciting hours of game play

REACHES THE SCORES OTHER JOYSTICKS CAN'T

ONLY £10·95 inc VAT



EPSON FX80
FOR THE COMMODORE 64

This most popular of HIGH PERFORMANCE dot-matrix printers can now be connected to your COMMODORE 64. SUPPLIED COMPLETE with the Audiogenic Monitor Cartridge and Centronics lead. Ready to plug in and print. No longer are you restricted to the performance of Commodore's own printers. Print at 160 cps in up to 18 different print styles and sizes, or download your own character set. Enjoy Epson quality and speed.

ORDER TODAY

ONLY £425 COMPLETE inc VAT

COMMODORE 1541 DISC DRIVE

FREE software

6 games + Easy Script Word Processor AND Future Finance
An Unbeatable Combination!!
Speed up your Business today

We can supply the largest range of COMMODORE 64 software. Order with Confidence today. We specialise in being first with the best.

ONLY £229 inc VAT

WE STOCK A VAST RANGE OF BOOKS.
PLEASE RING.
OVER 50 IN STOCK.

THE COMPUTERAMA 64 PRICE PROMISE

Our prices are the BEST. If you find that you could have bought an identical product, currently advertised and in stock at a lower price, we will CREDIT the difference.

COMPUTERAMA 64 are planning many exciting deals for 1984. Drop us a line, we'll put you on our mailout list and keep you in touch with the exciting world of Computerama 64. Do it today. It costs nothing and the benefits are enormous.

THE COMPUTERAMA 64 GUARANTEE OF SERVICE

So sure are we that we have the BIGGEST & BEST catalogue of software and accessories – over 600 items – that WE CHALLENGE YOU to order an item we can't supply. Give us 7 days, if we can't despatch we will send you a FREE GIFT – And return your cheque.

SAME DAY DESPATCH ON STOCK ITEMS

RING FOR LATEST PRICES

MANY REDUCTIONS EXPECTED

MONEY SAVER!
50p
MONEY SAVER!

FREE with every order, five pounds worth of moneysaving vouchers

ALLIGATA		INC VAT
Aztec Tomb Adventure	C	7.95
Bat Attack	C	7.95
Blagger	C	7.95
Damsel in Distress	C	7.95
ANIROG		
Galaxy	C	7.95
Krazy Kong	C	7.95
Moon-Buggy	C	7.95
Skramble	C	7.95
3-D Time Trek	C	7.95
AUDIOGENIC		
Motor Mania	C	8.95
Grand Master Chess	C	17.95
Road Toad	C	7.95
R-Nest	C	7.95
Word Hunt	C	7.95
BUBBLE BUS		
Hustler	C	6.99
Kick-Off	C	6.99
Widows Revenge	C	6.99
GAMES MACHINE		
The Fabulous Wanda	C	7.95
LLAMASOFT		
Hovver Bovver	C	7.50
Lazer Zone	C	7.50
Matrix	C	7.50
Mutant Camels	C	7.50
Mutant Camels Revenge	C	7.50
LIVEWIRE		
Grid Trap 64	C	7.95
Jumping Jack 64	C	7.95
MERLIN		
Crazy Caveman	C	7.95
Blue Moon	C	7.95
Pixie Pete	C	7.95
MELBOURNE HOUSE		
Hobbit	C+B	14.50
MONDATA		
Super Copter	C	7.95
Tax-Man	C	7.95
OCEAN		
Hunchback	C	6.90
Mr Wimpy	C	6.90
QUICKSILVA		
Aquaplane	C	6.95
Purple Turtles	C	7.95
Quintic Warrior	C	6.95
Ring of Power	C	6.95
ROMIK 1		
Dickies Diamond	C	7.95
Stellar Triumph	C	7.95
TERMINAL		
Super Dogfight	C	7.95
Super Gridder	C	7.95
VIRGIN		
Falcon Patrol	C	6.95
PRINTERS FOR 64		INC. VAT
Commodore MPS 801		229.00
Commodore 1520 4 Colour Printer Plotter		99.95
Epson RX80		279.00
Epson RX80 FT		299.00
Epson FX80 Package		425.00
Juki 6100 Daisywheel 18cps		448.00
Centronics – Monitor Interface		29.95
Centronics – Cassette Driver		7.95
Centronics – Cable		14.95
MONITORS		
Commodore 1701 Colour		219.00
Fidelity 14" Colour		229.00
Sanyo 12" Green		89.00
Phoenix 12" Amber H Res		129.00
ACCESSORIES		
1541 Disk Drive + Easy Script + Future Finance + 6 free Games		229.00
C2N Cassette Recorder		44.90
Cassette Interface		14.90
Deluxe Dust Cover		5.95
Tac II Joystick		18.95
Quickshot II Joystick		10.95
Stack Light Pen		27.95
IEEE Interface		87.00
Interpod		114.95
KoalaPad Touch Tablet		83.95
Video Cable		10.95
Z80 Video Pak	(Rom)	249.95
COMMODORE EDUCATIONAL SOFTWARE		
Biology	C	9.95
Chemistry	C	9.95
English Language	C	9.95
Geography	C	9.95
History	C	9.95
Mathematics I	C	9.95
Mathematics II	C	9.95

COMMODORE BUSINESS SOFTWARE		
Easy Script	D	74.95
Easy Spell	D	49.95
Future Finance	D	74.95
Easy Stock	D	74.95
COMMODORE UTILITIES		
Intro to Basic pt I	C D + B	14.95
Intro to Basic pt II	C D + B	14.95
Gortec & Microchip	C	14.95
Assembler Tutor	C D	29.95
Assembler Development	D	24.95
Programmers Utilities	D	14.95
Petspeed 64	D	49.95
Simons Basic	R	49.95
COMMODORE GAMES SOFTWARE		
International Soccer	R	9.99
Lazarian	R	9.99
3rd PARTY BUSINESS SOFTWARE		
Micro Simplex	D	172.50
Multiplan	D	79.95
Practicalc	D	39.95
Superbase	D	99.95
Wordcraft 40	R	89.95
Magpie	R	99.95
Templates for Magpie	D	29.95
ANAGRAM		
Sales Ledger	D	75.00
Purchase Ledger	D	75.00

DIALOG		
Transact	D C	30.00
Invostat	D C	30.00
Database + Labels	D C	34.00
DFM Database	D C	24.00
KOBRA		
Sales Accounting	D	113.85
Purchase Accounting	D	113.85
Stock Control	D	113.85
Diary 64	D	44.85
Calc Result	D R	125.35
Easy Calc Result	D	78.85
Paper Clip	D	98.90
LIVEWIRE		
Grid Trap 64	C	7.95
Jumping Jack 64	C	7.95
MERLIN		
Crazy Caveman	C	7.95
Blue Moon	C	7.95
Pixie Pete	C	7.95
MELBOURNE HOUSE		
Hobbit	C+B	14.50
MONDATA		
Super Copter	C	7.95
Tax-Man	C	7.95
OCEAN		
Hunchback	C	6.90
Mr Wimpy	C	6.90
QUICKSILVA		
Aquaplane	C	6.95
Purple Turtles	C	7.95
Quintic Warrior	C	6.95
Ring of Power	C	6.95
ROMIK 1		
Dickies Diamond	C	7.95
Stellar Triumph	C	7.95
TERMINAL		
Super Dogfight	C	7.95
Super Gridder	C	7.95

FROM THE U.S.A

ADVENTURE INTERNATIONAL		
Arex	C D	28.95
Airline	C D	20.50
Diskey	D	36.00
ARTWORX		
Spare Change	D	24.95
Strip Poker (over 18's)	D	26.50
ATARISOFT		
Centipede	R	39.95
Defender	R	39.95
Donkey Kong	R	39.95
Pacman	R	39.95
BRODERBUND		
Davids Midnight Magic	D	24.95
Choplifter	R	26.95
Serpentine	R	28.95
Seafox	R	28.95
Lode Runner	D R	24.95 29.95
DATAMOST		
Aztec	D	28.95
Swashbuckler	D	24.95
Roundabout	D	21.50
Bilestoad	D	21.50
Mating Zone	D	21.50
Paint Wizard	D	35.95
Wizz n' Roo	D	24.95
Monster Smash	D	24.95
Paint Wizard	C	35.95
Topsee-Turvee	C	24.95
DATASOFT		
O'Riley's Mine	C D	21.95
Moon Shuttle	C D	21.95
Pooyan	C D	21.95
ELECTRONIC ARTS		
Hard Hat Mack	D	29.95
Worms	D	29.95
Mule	D	29.95
Pinball Construction Set	D	29.95
Archon	D	29.95
Murder on the Zinderneuf	D	29.95
The Tesserat Strategy	D	29.95
EPYX		
Crush Crumble Chomp	C D	20.45
Curse of Ra	C	13.45
Jump Man	C D	27.50
Jump Man Junior	R	28.95
Pitstop	R	33.15
Sword of Fargoal	C D	20.50
Temple of Apshai	C D	24.95
Upper Reaches of Apshai	C D	13.50
FIRST STAR		
Bristles	T	24.95
Flip & Flop	T	24.95

FUNSOFT		
Snookie	C D	24.95
HAYDEN		
Sargon Chess II	C D	28.95
INFOCOM		
Deadline	D	34.95
Starcross	D	28.95
Zork I II & III	D	28.95 each
Suspended	D	35.95
Witness	D	35.95
Planetfall	D	35.95
Enchanter	D	35.95
Infidel	D	35.95
MMG		
Final Flight	D	25.95
MUSE SOFTWARE		
Castle Wolfenstein	D	24.95
SCREENPLAY		
Pogo Joe	C D	25.95
SEGA CONSUMER PRODUCTS		
Star Trek	R	28.95
Buck Rogers	R	28.95
Congo Bongo	R	28.95
SIERRA ON LINE		
N Crossfire	D	21.95
Frogger	D C	24.95
Threshold	R	27.95
Jawbreaker	D R	27.95
Mr Cool	R	27.95
SIRIUS SOFTWARE		
Snake Byte	D	24.95
Bandits	D	29.95
Way Out	D	29.95
Blade of Blackpoole	D	22.50
Fast Eddie	D	24.95
Turmoil	D	24.95
Repton	D	29.95
Squish 'em	D	24.95
Gruds in Space	D	27.50
Wavy Navy	D	29.95
STRATEGIC SIMULATIONS		
Knights of the Desert	D	29.00
Combat Leader	D	29.00
Eagles	D	29.00
SUBLOGIC		
Flight Simulator II	D	29.95
Night Mission Pinball	C D	21.95
SYNAPSE		
Ft Apocalypse	C D	23.00
Drelbs	C D R	24.95
Sentinel	C D	24.95
Protector II	C D	24.95
Shamus	C D	24.95
Survivor	C D	24.95
Blue Max	D	24.95
Zaxxon	D	24.95

ORDER BY MAIL
No Stamp Required
Post your order today to
COMPUTERAMA
DEPT. CBM 2
FREEPOST
STAFFORD ST16 2BR

ORDER BY TELEPHONE
For ACCESS or VISA 24 hour ORDER HOT-LINE
Dial 0785 44222

CARRIAGE
50p postage on all orders under £25
Securicor delivery on high value items £8 eg printers, monitors, disc drives

Computerama 64

STAFFORD
59 Foregate Street

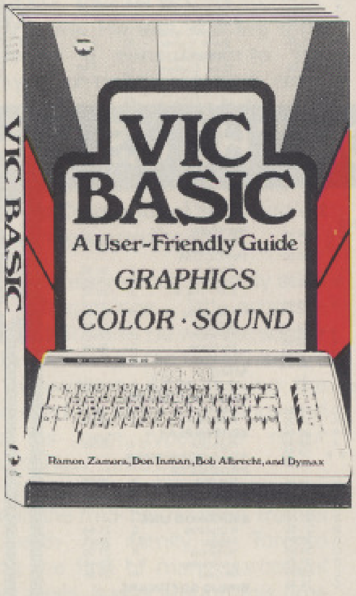
STOKE-ON-TRENT
11 Market Square Arcade,
Hanley

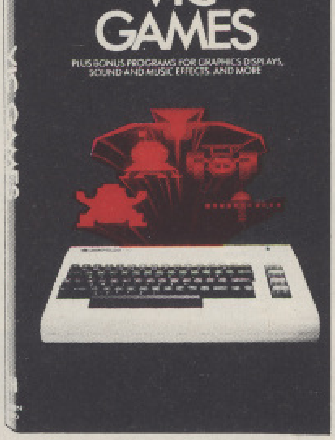
SHREWSBURY
13 Castle Gates

MAKE THE MOST OF YOUR COMMODORE

Vic Basic

A step-by-step introduction to the VIC 20 computer and its language, Vic Basic. Teach yourself how to use the Vic to create your own programmes, music and art. Also included are puzzles, exercises and games programmes. **355 pages.**


VIC BASIC
VIC BASIC
A User-Friendly Guide
GRAPHICS
COLOR · SOUND
Ramon Zamora, Don Inman, Bob Albrecht, and Dymax


VIC GAMES
PLUS BONUS PROGRAMS FOR GRAPHICS DISPLAYS, SOUND AND MUSIC EFFECTS, AND MORE

Our guarantee

- * We offer books which provide clear and concise information about Commodore computers, written by experts.
- * Prices to our customers (inclusive of p & p†) will always be lower than RRP.
- * Despatch within 14 days of receipt of order or money back.

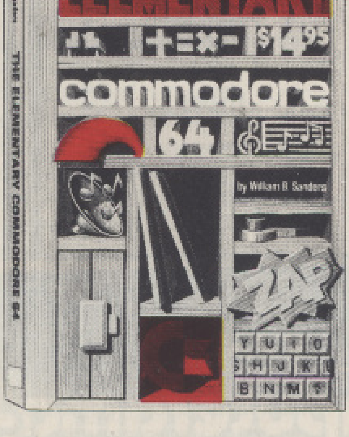
Vic Games

A collection of 36 arcade-style, strategy and educational word games for you to write and play. Create your own sound, music, utilities and graphics programmes that are real fun. A must for every Vic 20 owner. **183 pages.**

The Master Memory Map
BASIC BAY
Paul Pavelko and Tim Kelly

The Master Memory Map for the Commodore 64

Full of useful explanations and examples. This book is a guided tour of all the memory locations – places inside your computer that make it act in special ways.
You learn lots of uses for the Commodore 64, including how to make music and how to create the special characters used in games.
185 pages.


THE ELEMENTARY
from DATAMOST, INC.
+=×- $14.95
commodore 64
by William B. Sanders
ZAP
THE ELEMENTARY COMMODORE 64

The Elementary Commodore 64

A beginner's step-by-step introduction to the Commodore 64, Basic and how to programme. Includes POKE and PEEK, secrets, formatting text, data manipulation, arrays, editor, graphics and helpful hints. **230 pages.**

Please supply book(s) indicated.
I enclose cheque/money order for £ ....

Name ....

Address ....

....

☐ Vic Basic A user friendly Guide	£9.95
☐ Vic Games	£6.95
☐ The Elementary Commodore	£10.45
☐ The Master Memory Map	£10.25

† (Please add 80p for postage & packing)

ORDERS TO:
SOFTALK
16-18 Princess Victoria Street,
Clifton, Bristol BS8 4BP.
Telephone Bristol 0272 877245.

softalk

SOFTALK 16-18 Princess Victoria Street, Clifton, Bristol BS8 4BP. Telephone Bristol 0272 877245.

CBM's easy wordpro

EASY SCRIPT is Commodore's very own word processor for the CBM-64. John Probert tests the product for us.

EASY SCRIPT comes well packaged in a stout box containing a couple of programmed disks – one is a thoughtfully provided backup copy – and a handsome blue book of about a hundred pages. This is the User Guide, and it is without doubt one of Commodore's best efforts; avoiding both the almost total inscrutability of the manual supplied with the (1540) disk drive, and the dreadfully overwritten instructions that come with its VIC Stock Control – this latter takes about twelve pages to tell you that the Stock Control program is a system for controlling stock!

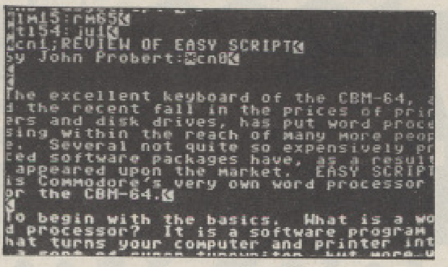
The disks would seem to be an expedient to get the processor on to the market early, for the intention, so I understand, was for it to be provided on a cartridge. This would be much more convenient, for then you could just plug in and go; but from a company that changes its mind about four times a week, I would not rely on its ever appearing. Certainly I have not been able to discover if it would be possible to trade in the disks against the cartridge, should it become available.

While loading the disk the screen shows the program title in a variety of colour combinations, and when loading is complete you are confronted with a disappointingly drab grey and white display.

You are first asked to choose the width of screen text. This would normally be (for the CBM-64) 40 columns, but up to 240 colums can be selected for exceptional text formats. You can next choose to store your text on disk or cassette, but since you have just loaded the program from disk it would seem odd to wish to file the results on to tape, with all its inconvenience.

Finally you can choose from a list of printers the one you wish to use. This gives the program tremendous versatility.

Having made your choices the screen changes to put you into what is called EDIT mode. And the first pleasure is to discover that you are not stuck with the depressing initial colour scheme. By using the CTRL key and keys 1, 2 and 3 you can change the border, background and text colour to suit your own taste and mood.



```
1M15:rM65◄
t154: ju1◄
cn1;REVIEW OF EASY SCRIPT◄
y John Probert:cn0◄
◄
◄
he excellent keyboard of the CBM-64, a
d the recent fall in the prices of prir
ers and disk drives, has put word proce
sing within the reach of many more peop
e.  Several not quite so expensively pr
ced software packages have, as a result
 appeared upon the market.  EASY SCRIPT
is Commodore's very own word processor
or the CBM-64.◄
◄
o begin with the basics.  What is a wo
d processor?  It is a software program
hat turns your computer and printer int
```

A screen shot showing EASY SCRIPT in the Edit Mode.

The manipulation of text is accomplished by the use of format instructions. These can be sprinkled throughout the text at convenient intervals, but the normal proceedure will be to bunch the main ones together at the beginning. The instructions will be displayed upon the screen, but, of course, they are not recorded upon the completed document. Each one is obtained by first using the function key F3, which places a reverse field asterisk at the start of the line. This is then followed by the format instruction.

This instruction can be one of many. It can give the document a title of your choosing, which can later be used for filing purposes. It can be used to set the margins of the paper; to justify the right margin; to centre a heading; create page numbers; decide line spacings, etc, etc.

You can make the format instructions as simple as you like for straightforward documents, and only with time and experience do you need to involve yourself in the complexities of all the rich and varied instructions that are (quite literally) at your fingertips. This means that you can put the program to use – after learning a few of the commands – from the very first day.

The topmost line of the screen display, the one above the first format instruction, is called the STATUS line, and this is entered by pressing the F1 function key. If you are tapping in text this will normally display EDIT MODE, and will also record the position of the flashing cursor in terms of lines and columns. A change of function – or MODE, as it is called – to, say, COMMAND mode to output to the printer is accomplished by pressing F1; entering O for output, followed by P for printer.

Formatted text can also be displayed upon the screen, prior to printing, and if the print format is wider than the screen (which with a 40 column screen it almost always is) you can view the entire document by scrolling back and forth and down – but with EASY SCRIPT not up!

The command mode can also be used to erase text, delete text, (yes, there is a difference), file your document, load another document, etc. But for now, back to the EDIT mode and the entering of the text itself.

Using EASY SCRIPT the CBM-64 keyboard functions for the most part just like a normal typewriter keyboard, so a trained touch-typist, having first got used to the "feel" of the keys, should have no difficulty using it. The unshifted text is displayed in lower case letters: capitals and punctuation marks are obtained in the usual way by using the shift key.

The shift lock works just like the one on a typewriter, but as an added convenience the F5 key gives you capital letters without altering the function of the other keys on the board. This is a most useful asset. The major difference from typing on a typewriter is in using the RETURN key. You do not press this at the end of a line. You just carry on typing regardless, and the cursor automatically moves to the beginning of the next screen line.

Since this is done in the middle of a word if needs be, the result can look a little odd at first, but you soon get used to it. The true line ends are decided (in accordance with the format instructions) when the text is output to the printer or screen. The RETURN key is only used at the end of a paragraph or to mark a blank line.

The common alterations to text such as corrections to spelling, removal of typing errors, the adding, deleting or changing of odd words, are all easily accomplished by the use of the normal cursor controls together with the INSERT and DELETE keys. Words and phrases can be simply typed over on the screen, taking care not to use the RETURN key as when programming, for this would wipe out the remainder of the line!

This easy method of correcting is a great boon to an enthusiastic, but inaccurate typist like myself, for I can bash away at the keys as inspiration moves me, ignoring the mistakes as they happen,

Small Business Accounts and V.A.T. Returns made Simple

- ★ Simple step-by-step accounting for retailers and smaller businesses.
- ★ Records receipts over 10 headings and payments over 50 headings.
- ★ Records Unpaid Bills and gives a list of amounts owed.
- ★ Based on Vyners Simplex Cash Book and recommended by them.
- ★ Automatically produces your VAT Return for Special Schemes A-F.
- ★ Cash and Bank Balances displayed on the screen at all times.
- ★ Summaries of all information for the year available on the printer.
- ★ 120 page manual written by Geoffrey Whitehead, author of the 'Made Simple' Series of Books.
- ★ Runs on the 64 with 1541 Disk and Printer or with IEEE Interface and 8000 Series peripherals.
- ★ User Club with many facilities available for small annual outlay.
- ★ Full Profit and Loss Account any time you like.
- ★ Shows Bank & Cash Balances on screen all the time.

The Electronic Cash Book

MICRO
SIMPLEX

★★ Now on 64 or SX-64 ★★

Post in envelope. No stamp required.

Micro-Simplex Ltd.
FREEPOST, Macclesfield,
Cheshire, SK11 6YA.

Please send further information to:

Name ....

Company ....

Address ....

....

Tel. No ....

CCI.384

then returning later to tidy up the whole thing. I find the constant need to resort to the correcting ribbon on my electric typewriter an inhibiting and daunting distraction.

More major alterations of text such as the removal and replacement of whole sentences or even the swapping over of complete paragraphs are best performed by using format instructions, all of which are fully detailed in the excellent manual.

There are far too many facilities to detail here, but perhaps I should mention one or two. One is called MAIL MERGE, and this allows you to send a "personalised" letter to a group of people, drawing upon what is called a FILL FILE to provide names and addresses. Myself, I dislike to receive such "personalised" letters, and consign them, unread, into the wastepaper basket; but still, I can see that is a facility that a lot of people would want from a word processor. Forms can be filled in using the TAB function (both horizontal and vertical), or what are called MEASURED BLOCKS.

Your completed (or uncompleted, for that matter) text can be easily saved as a file on to disk. It can also, as we have said, be saved on to cassette. A few disks could accommodate a large amount of material and perhaps replace those dreary filing cabinets. One step nearer to the so-called paperless office. Though, ironically enough, since I computerised a lot of my own activities I seem to be using vastly greater quantities of paper than ever before.

The final presentation of your text depends, of course, upon the quality of your printer. My dot-matrix 1515 printer, though a good work horse, leaves something to be desired when it comes to correspondence. The lack of descenders, for instance give the print a decidedly odd appearance, and, I hear, causes distress to overworked and underpaid print compositors. (no boys, please don't send the pickets round, it was just my little joke!).

Since paper may only be tractor fed you are stuck with using the usual perforated stuff, which is hardly going to create much of an impression among the punters who are going to invest money in your business. But, encouragingly, a few daisy wheel printers are starting to emerge that, while hardly discount house material, are just a little less than the cost of a motor car. Illustrated is an example of the print obtained from the new JUKI daisy wheel printer priced at well under £500. (Courtesy of Taylor Wilson Systems of Dorridge).

EASY SCRIPT contrives to work the 1515 printer without the usual annoying and irritating need to blank out the screen, though the printer does hang up occasionally; a hiatus that can only seem to be overcome by switching the printer off and on again. But this is presumably the design fault in the 64 (and one that has been strangely uncommented upon by the pundits in the magazines) and not a defect in EASY SCRIPT. One disappointment, however, is the inability of EASY SCRIPT to allow you to use any of the graphic symbols obtainable on the CBM-64 and the 1515.

To sum up. Do I like EASY SCRIPT? Yes I do, very much. Do I use it? Yes I do, all the time. I typed and corrected this article using it, and the memory of the 64 will retain it all without the need to resort to split files. One last facility to mention. Like the manual writer, throughout the review every time I wanted to type in the words EASY SCRIPT I typed in ES instead; then finally I used the SEARCH AND REPLACE command to substitute EASY SCRIPT for the abbreviation.

Any complaints? Well, for myself, only two. The inability to use the 64's graphics, which could be really useful for laying out some documents: and the price. I was relieved of £85 for my EASY SCRIPT, though I understand the going price is now £75. This is still far too much to pay for a couple of disks and a book.

I realise that development charges are heavy, but with the greater volume of sales that this program undoubtably deserves to achieve, perhaps Commodore will pursue its avowed policy of pricing to suit the pocket of a mass market.

P.S. Since writing the above paragraph, I have read that Commodore have announced one of their special offers. The price of the disk drive has been again reduced from £230 to £199, and they are throwing in EASY SCRIPT free! What can I say? Some people charge that for the word processing software alone. Go out and buy one, while, as they say, stocks last.

Word games

In spite of its name Wordpower is not just another wordprocessor. Produced by Sulis Software and distributed by John Wiley, Wordpower is an educational vocabulary and spelling package for the 64.

One of the main aims of CAL is to make learning fun. To this end Wordpower contains two games with different levels of difficulty. It is a menu driven program which makes it relatively easy to use but does presume that the user will be familiar with the words displayed on the menu.

Some of them are tough words and might challenge your average Sun reader! Menu options include, for instance, Opposites, Similies, Collectives, Synonyms, Adjectives and Nouns.

In each section of the program there is a choice between a 'game' or a 'writing' option. The game option is itself further subdivided into two choices – Lines or Shooting. Lines is a multiple choice game in which the user would be asked to match one word with another in a list of words. Britain, for instance would match with British. The Shooting game involves destroying the incorrect word by using the space bar to shoot it.

Throughout the program the screen displays are very simple. There's none of the spectacle of the arcade game though there is an obvious attempt to emulate them. Children, or even adults with reading difficulties, may find the game reasonably entertaining.

But the vocabulary is limited to 1,200 words and we must question the idea that it's enough to provide learners with a simple game. Kids these days are used to playing the most sophisticated arcade games and Wordpower won't fool them for one minute. One can imagine a child resenting the attempt to trick him into learning.

Having said that, Sulis Software have made a very honourable attempt to make learning about language as enjoyable as possible. The vast majority of CAL software works along similar lines and within that context Sulis Software's Wordpower is good.

Name: Wordpower
Company: Sulis Software, 4 Church Street, Abbey Green, Bath, Avon
Product: Educational game
Applications: Education
Documentation: Poor leaflet. Most instructions are on the cassette
Minimum hardware: 64, monitor and cassette player
Price: £9.95 plus VAT

PRODUCTS FOR COMMODORE

SPEED UP ANY BASIC PROGRAM WITH OUR COMPILERS

Up to 40 times speed increase, reduced program size.

BASIC COMPILERS

Petspeed Compiler for 4000/8000 series	£125.00
Integer Basic Compiler for 3000/4000/8000 series	£75.00

CROSS-COMPILERS FOR BASIC

Portspeed: Compiles source on 8000 series to run on CBM 64	£125.00
X-64: Integer compiler compiling on 8000 series giving machine code executable on CBM 64	£125.00
B-Port: Compiles source on 8000 series to run on 700/B-128 series	£450.00
X-700: Integer compiler compiling on 8000 series giving machine code executable on 700/B-128	£450.00

GIVE YOUR VIC OR 64 FULL IEEE AND RS232

Not a cartridge. Compatible with any software.

Interpod: Free-standing interface giving IEEE488 and RS232C capabilities to CBM64/VIC20	£99.95

SPECIAL OFFER

Order 5 or more Interpod and get a free Portspeed!

All prices are exclusive of VAT. There is also a small charge for post and packing. Dealer discounts are available on all products except the 700 cross-compilers.

Compilers are supplied ex-stock; Interpod supplied 7-days ex-stock.

COMMODORE SOFTWARE

Native compilers for the CBM 64 and the 700/B-128 are available only from Commodore.

Oxford Computer Systems (Software) Ltd.
Hensington Road, Woodstock, Oxford OX7 1JR, England
Telephone (0993) 812700 Telex 83147 Ref. OCSL

VISA ACCEPTED

NOW AVAILABLE FOR YOUR CBM 64

HIT AND RUN

For all cricket fans, Sunday league cricket for your 64.

One or Two player games allows you to captain and select your team in a **40** overs innings match. **30** players available for selection which offers literally millions of permutations. Conditions vary from match to match. Includes **run-outs, wides, no-balls, byes and leg-byes.** Man of the match decision at end of each match. Captain of batting side has the opportunity to adjust his tactics at intervals of 7 overs or at the fall of a wicket. The captain of the fielding side can adjust his tactics at the end of each over. As in Sunday league cricket bowlers are limited to 8 overs and may not bowl two successive overs. Batsmen improve as their innings grows whereas fatigue can make bowlers and fielders less effective.

*A very addictive game, excellently written by **David T. Coates.** A must for all cricket fans.*

On cassette only **£7.95**
On disc only **£9.50**
Please include 50p postage and packing.
A large selection of software as available for your 64 including:

China Miner – **£7.00** Metamorphasis – **£7.95** Mission on – **£7.95** Mothership – **£6.96** Zyborian Terror (adventure) **£7.50**

Please include 50p postage and packing when ordering these titles.
SAE for complete list.

BYTEWELL
203 Court Road, Barry
South Glamorgan CF6 7EW.
0446-742491.

Stack aim high

Stack Computer Services have adapted the principle of light pens and developed a Light Rifle for use with CBM 64 and Vic 20. The rifle is made of plastic and comes in a kit form. Included in the package are the necessary interfacing gadgets and a game cassette.

The television screen must be so positioned that little or no extraneous light falls on the screen. This is due to the sensitivity of the light receptor in the rifle. The rifle reacts to the light coming from the television screen and can actually distinguish differences in the colours – white and red being the most visible and blues least, so the user must create a good colour balance prior to playing any games.

Depending on the quality of picture the user will normally be able to play fast and accurate games from 8 to 12 feet away from the television set.

The actual assembly of the rifle is a simple matter. The butt clips onto the pistol unit, which houses the touch contact and light sensitivity device, just behind the hand grip. The rifle barrel slips into and locks onto the pistol barrel for easy conversion. Without the butt the rifle becomes a hand gun.

The games supplied on the cassette are: High Noon Shootout, the aim of which is to protect your land from being blown up by a gang of bandits; The Glorious Twelfth, the man in the street's opportunity to go grouse hunting. And finally, Gallery, where the user has to have fast reactions to shoot down a target as it bounces around in an open box.

The games are reasonable but not sensational and one suspects that there is potential for much better games. Our rifle worked well and, once you get used to its little idiosyncracies – the sights weren't lined up quite correctly – it is surprisingly accurate.

All in all the package is a useful and enjoyable addition to the enthusiasts collection of games paraphenalia.

Name: Stack Light Rifle.
Company: Stack Computer Services, Derby Road, Bootle, Liverpool. Tel: 051 933 5511.
Product: Light Rifle.
Applications: Games.
Documentation: Adequate leaflets.
Minimum hardware: Vic 20 or CBM 64, cassette recorder, television set.
Special Features: Kit includes a cassette containing three games which will run on both the Vic 20 and CBM 64.
Price: £29.95 including VAT.

Micro's talk back

Adman's package looks very much like an expansion cartridge and fits into the expansion port at the back of the VIC. Voice synthesisers such as Adman's package work by breaking language down into its basic sounds. One of the problems is that there are far too many of these basic sounds, or allophones, to be stored in the memory of a home computer, even with a memory as big as the Commodore 64.

The Adman Speech Synthesiser uses 64 allophones altogether and combinations of these allophones produce the words. Not all allophones can be used with all others, of course. Many combinations of consonants, for instance, would be impossible in many languages. And more than three vowels together is unlikely in English.

Each key produces a sound and the sounds are strung together to produce a word when function key F3 is pressed.

Lack of space in each operating block means that only 30 allophones can be coped with at a time. Bundles of 30 allophones or less are therefore stored using string formats. It is possible to disable the voiceback by using the RUN/STOP and RESTORE keys or by keying in SYS41009, which stops the repetition of individual keys. There are pauses of several lengths, lasting from 10 milliseconds to 200 milliseconds, which prevent words running into each other.

Allophones don't unfortunately always correspond exactly to spellings. Split into Adman allophones, for instance, the word 'answer' becomes A/N/S/ERR. This would limit the package's educational value to some extent.

So what uses might Adman's Speech Synthesiser have? It might be useful for amateur games programmers and it can certainly be a great deal of fun. Like all other speech synthesisers we have seen (or should we say heard?) it has its limitations. This is obviously a field where a great research might produce some impressive results. There are universities where exciting work is being carried out in co-operative ventures between computer departments and linguistics departments.

Meanwhile packages such as Adman's provide a useful entertainment and, for some, a useful tool.

Title: Speech Synthesiser
Company: Adman Electronics, Ripon Way, Ripon Road, Harrogate, North Yorkshire HG1 2AU. Telephone (0423) 62642
Product: Voice Synthesiser
Applications: Education and games programming
Documentation: Adequate manual with sample programs
Hardware: Unexpanded VIC (and now, we understand the 64) with TV
Price: £49.95 including VAT

Double trouble with a

Owen Murcott's practical feature about linking any two Commodore machines through their user ports continues with a two-machine game this month. If you missed the earlier articles in the series, you should write to Commodore Computing International for the back issues you need. You will then be able to start from the beginning with simple DIY instructions on how to make the connector, and how to control the user port from BASIC. You don't always have to write assembler programs to get two machines to communicate.

Looking back over this series, I see that I have only given you skeleton programs to demonstrate the principles of machine-to-machine communication through the user port. Although perhaps instructive, they are a bit boring and not of immediate use. This month I thought I would liven things up a bit by giving you a game. It is not original, but is based on one of the first games which ever appeared for the PET, named 'Wrap Trap'. I bought a copy in 1978 with my first machine. Quite simply, you and the machine try to wrap a wall around each other, causing the other to crash. In my opinion, Wrap Trap still meets all of the criteria for a good game!

Double Wrap Trap

The original version of Wrap Trap on the PET ran as 'player vs machine'. I have modified it to give you a two-machine version: player vs player. It uses the VARLINK routine from last month's article to pass variables from one machine to the other; your machine displays your opponent's moves on your screen. So you must load VARLINK first, and reset the memory limit to protect it, before you load the game.

Line 410 includes a relatively uncommon feature – the program prints an 'INSERT' character. Its function is to push the final dot into place on the screen for the matrix guide. You cannot enter an INSERT character into a program by merely pressing that key. Try it, and you will see that it just opens a gap, as usual. To obtain this character in BASIC text:

- * Type the line as listed, but with a space in place of the INSERT character;
- * Press RETURN;
- * Move the cursor back up to that space character, press RVS ON, type a shifted 't' character;
- * Press RETURN.

The reversed shifted 't', which is BASIC's encrypted 'INSERT', will remain in the text.

The listing includes alternative lines for different machines – leave out those which are not for your machine. You will see that I have suggested that you use number keys on PET, and function keys on VIC and CBM64, to control the wall-maker. The VIC function keys will not do this if you have a 'Super Expander' cartridge plugged in to expand the memory; you can only use a 3K RAM cartridge. Also you will need to adjust the layout of instructions to get a tidy appearance on the VIC screen. Use the alternative version of VARLINK (explained further on) which loads to location 7168, if you run the game on an unexpanded VIC, so that you will not run out of memory.

Wait

Look at lines 520/720 and 620/820 of DOUBLE WRAP TRAP. You will see that at one moment the machine is the master, at another it is the slave. The slave waits for the master and cannot go on until the master has communicated. Notice that the slave does not impose itself on the master; the master invites communication when it is free. From the slave's point of view, it has to wait until the master signals that it wants to talk, or that it is ready to listen.

Interrupting

Sometimes, either machine must be able to impose itself on the other, interrupt it, and demand attention. Neither is master nor slave; they are equal partners. This kind of system can best be implemented using the mechanism built in to the hardware of the microprocessor which permits it to be interrupted. The 6500 series of microprocessors used by Commodore will react to three different kinds of interrupt, created and controlled in different ways. Two of them affect data transfers on the user port, in addition to their other functions. The main one is known as IRQ (Interrupt ReQuest).

IRQ – What is it?

IRQ interrupts are constantly being created within the machine, by the clock for example. 60 times per second, or so, the clock signals the microprocessor to interrupt your program. The operating system then does various pieces of housekeeping. One of them tests whether you are pressing a key on the keyboard. If you are, the code for the key pressed is placed in the input buffer. BASIC programs are constantly being interrupted – it all happens so fast that you never notice.

When an interrupt occurs the microprocessor will:

- * Stop at the end of execution of the operation currently being obeyed in your assembler program (or in the interpreter if your program is in BASIC);
- * Make a note of where it had got to;
- * Stop any further interrupts happening until it has . . .
- * Got the address of an alternative set of instructions (the interrupt routine) and executed them to their end.

The interrupt routine is built in to ROM. At the end of it is an RTI (ReTurn from Interrupt) instruction. Its effect is to send the microprocessor back to where it originally left off in the main program,

a two-machine game

which continues as though nothing had happened.

Interrupts spoil timing

There is a timing problem in assembler programs when the master machine wants to send (or get) bytes on the data link. It has to wait until the slave is listening and ready to communicate. The handshaking during this waiting period has to be very carefully timed; last month's timing diagram explained the problem. But interrupts will spoil it. Execution of the built-in interrupt routine takes an appreciable amount of time – this causes delay. If an interrupt happens at the wrong moment, the machines get out of step, and may hang up.

Don't interrupt until I've finished!

You can prevent the microprocessor from recognising an IRQ interrupt, and thereby you can eliminate the delays. The instruction to use in an assembler program is SEI. This sets the interrupt flag in the status register. (The microprocessor will also set it quite automatically when an IRQ interrupt occurs.) The normal purpose of this flag is to prevent any further interruption until the IRQ routine has been executed. Otherwise it might just go round in ever-decreasing circles! So, by setting the flag, you will disable the IRQ interrupts, and by clearing it with CLI you will re-enable them.

NMI and the Commodore 64

There is a second kind of interrupt which cannot be disabled by an SEI instruction. It is called NMI (Non-Maskable Interrupt). It has a higher priority than IRQ. Even though an IRQ interrupt may occur at the same time, NMI will take precedence. Unfortunately, the user port interface chip on the Commodore 64 can cause NMI interrupts, and SEI doesn't stop them.

Later in this article, I explain how to enable the user port to cause interrupts. On the Commodore 64, NMI interrupts from the user port chip can sometimes be enabled by routines in the operating system in ROM. You must disable them at each entry point, to ensure that they do not happen during your assembler program and introduce delays into the handshaking. The procedures for disabling are similar to those for enabling, explained later.

```
10 rem        double wrap trap                    w.owen murcott  december 1983
11 rem-------------------------------------------------------------------------
20 data 10,7,29,17,0,1,22,-1,0,60,1,0,62,0,-1,30:rem                        pet
21 data 144,240,31488,160,102,46,40,39,24,32768: rem                        pet
22 data 0,2,48,50,56: rem                                                   pet
23 poke 59468,14: rem                                                       pet
24 rem-------------------------------------------------------------------------
30 data 5,4,16,18,0,-1,30,-1,0,60,1,0,62,0,1,22: rem                        vic
31 data 788,121,7168,160,160,46,22,21,22,7680: rem                          vic
32 data 0,1,132,30720,2,6,133,136: rem                                      vic
33 poke 36879,8: print chr$(14)"<YELLOW>": rem                               vic
34 rem-------------------------------------------------------------------------
40 data 10,7,29,17,0,-1,30,-1,0,60,1,0,62,0,1,22: rem                     cbm64
41 data 788,240,39936,160,160,46,40,39,24,1024: rem                        cbm64
42 data 0,1,132,55296,2,6,133,136: rem                                     cbm64
43 poke 53280,11: poke53281,11: print chr$(14)"<YELLOW>": rem              cbm64
44 rem-------------------------------------------------------------------------
70 print "<CLS>Did you start this machine first (y/n)?
80 gosub 9000:if a$<>"y" and a$<>"n" then 80
90 ifa$="y" thenfg=1:z$="upper":u$="YOU":c$="HE":goto 100
91 fg=2:z$="lower":u$="HE":c$="YOU"
99 rem-------------------------------------------------------------------------
100 print "<CLS>    <RVS> W R A P   A R O U N D   T R A P "
120 print "<D>The object of the game is to trap your "
121 print "opponent.  Your wall-maker starts in the";
122 print z$ " part of the screen.
123 print "Control it with the keys  2 4 6 8 ": print: rem                  pet
124 print "8 - up     4 - left": rem                                        pet
125 print "2 - down   6 - right": rem                                       pet
126 print "Control it with the function keys": rem                  vic & cbm64
127 print "f1 - up    f3 - left": rem                               vic & cbm64
128 print "f7 - down  f5 - right": rem                              vic & cbm64
130 print"<D>"u$" will set the speed and start the":print"game with keys:
131 print"<D>F=Fast  M=Medium  S=Slow  Q=Quit
134 print"<D>At the game end the winner restarts the same way."
135 if fg=1 then fori=1to3000:next
199 rem------------------------------------------------------------------------
200 for i=1 to 4: read z: next
210 dim x(4),y(4),c(4)
211 for i=1 to 4:read x(i),y(i),c(i): next
220 read ir
230 read z: for i=1 to z: p$=p$+".": next
240 read v1: v2=v1+7
241 if fg=2 then z=ul: ul=cl: cl=z:rem                                      pet
250 read ul,cl,p
260 read f,mx,my,s,z,l,n
270 read sc,uc,cc: rem                                              vic & cbm64
280 read kl,kh
290 poke ir,peek(ir)+3: if fg=2 then 350
299 rem------------------------------------------------------------------------
300 print"<D><RVS>Speed? (f/m/s/q)
310 gosub 9000
311 if a$="f" then tl=0:goto 320
312 if a$="m" then tl=70:goto 320
313 if a$="s" then tl=150:goto 320
314 if a$<>"q" then 310
315 tl=-1
320 sys v2,tl:goto 400
350 print"<D><RVS>Opponent sets speed
360 sys v1
399 rem------------------------------------------------------------------------
400 if tl=-1 then poke ir,peek(ir)-3: print"<CLS>": end
410 print "<CLS>";p$;p$;p$;p$;left$(p$,mx)"<L><INS>.";
420 ud=3: cd=2: c=0
430 restore: read ux,uy,cx,cy
440 ua=s+ux+f*uy: ca=s+cx+f*cy
450 get a$:if a$<>"" then 450
460 if fg=2 then 720
499 rem------------------------------------------------------------------------
500 get a$:if a$<chr$(kl) or a$>chr$(kh) then 520
510 d=(asc(a$)-n)/l:if int(d)=d then ud=d
520 sys v2,ud
530 gosub 9070
540 gosub 9040
620 sys v1
630 gosub 9080
650 on c+1 goto 500,1000,1100,1200
699 rem------------------------------------------------------------------------
720 sys v1
730 gosub 9070
800 get a$:if a$<chr$(kl) or a$>chr$(kh) then 820
810 d=(asc(a$)-n)/l:if int(d)=d then cd=d
820 sys v2,cd
830 gosub 9080
840 gosub 9040
850 on c+1 goto 720,1000,1100,1200
899 rem------------------------------------------------------------------------
```

A mistake

The intent of this series of articles is to share my discoveries and the results of practical experiment. But because it is about experiments, it is also about mistakes.

In last month's versions of MEMLINK and VARLINK the interrupts are disabled while the master is awaiting the slave. Then they are re-instated so that the STOP key can be detected during execution of those machine code routines. This permits you to use the key to quit the machine code if necessary. When writing the Double Wrap Trap game for this month's article, I found that it would generally work, but would occasionally hang up. I could press STOP and abort the program, but then I couldn't continue. Eventually I traced the problem to the occurrence of an interrupt during the transfer of the bytes of a variable. It caused the handshaking to get out of step.

MEMLINK and VARLINK

Both MEMLINK and VARLINK are affected by the interrupt timing problem, but not my earlier PROGLINK routine. This month, I have given you a revised version of these two routines which will not hang up. There was no point in wasting space by giving the loader again, so I have omitted it and have just given the DATA statements. You can use the same loader as before.

There are two revised versions of VARLINK for the VIC. One will sit alongside MEMLINK, as in the previous version. The alternative version loads to the same locations as MEMLINK. (The first number in each group of statements is the start address of the routine; the second is a sumcheck.) I have provided the alternative version to use with 'Double Wrap Trap' on an unexpanded VIC.

Precautions

My conclusion, after fixing my mistake, is that it is a wise precaution in assembler programs to disable the interrupts for the whole duration of a data transfer on the user port. You need to:

- Disable IRQ interrupts with SEI;
- Stop the chip from causing further interrupts by storing the appropriate value in the Interrupt Enable Register (defined later).

Using SEI has the unfortunate side-effect of making the machine slightly less responsive to the keyboard. You may have to hold keys down for a moment,

```
1000 cs=cs+1:print"<CLS><RVS> "v$;:gosub 9090:on fg goto 350,300
1100 us=us+1:print"<CLS><RVS> "c$;:gosub 9090:on fg goto 300,350
1200 us=us+2:cs=cs+2
1201 poke a,214
1202 print"<CLS><RVS> B O T H";:gosub 9090:on fg goto 300,350
1999 rem----------------------------------------------------------------------
9000 get a$:if a$<>"" then 9000
9001 get a$:if a$="" then 9001
9002 return
9009 rem----------------------------------------------------------------------
9030 x=x+x(d):y=y+y(d)
9031 if x<z then x=mx
9032 if x>mx then x=z
9033 if y<z then y=my
9034 if y>my then y=z
9035 a=s+x+f*y
9036 return
9039 rem----------------------------------------------------------------------
9040 if tl then for i=1 to tl:next
9041 return
9049 rem----------------------------------------------------------------------
9070 x=ux:y=uy:d=ud:gosub 9030
9071 if peek(a)<>p then c=c+1
9072 poke ua,ul
9073 poke ua+sc,uc: rem                                            vic & cbm64
9074 poke a,c(ud)
9075 poke a+sc,uc: rem                                             vic & cbm64
9076 ua=a:ux=x:uy=y
9077 return
9079 rem----------------------------------------------------------------------
9080 x=cx:y=cy:d=cd:gosub 9030
9081 if peek(a)<>p then c=c+2
9082 poke ca,cl
9083 poke ca+sc,cc: rem                                            vic & cbm64
9084 poke a,c(cd)
9085 poke a+sc,cc: rem                                             vic & cbm64
9086 ca=a:cx=x:cy=y
9087 return
9089 rem----------------------------------------------------------------------
9090 print"   C R A S H E D ! "
9091 print"               <LLLLLLLLLLLLLLL>"v$"="us;c$"="cs
9092 return
9099 rem----------------------------------------------------------------------
```

```
READY.
 1000 ;*******************************************************************************
 1010 ;
 1020 ;SPECIMEN ASSEMBLER SOURCE CODE  -  PET BASIC4
 1030 ;DEMONSTRATES RE-DIRECTION OF IRQ
 1040 ;
 1050 ;*******************************************************************************
 1060        ;
 1070        ;                 PAGE ZERO LOCATIONS
 1080 CINV   =$90             ;RAM IRQ POINTER
 1090        ;
 1100        ;                 ROM LOCATIONS
 1110 IRQEND =$E600           ;IRQ ENDING ROUTINE
 1120        ;
 1130        ;                 CHIP REGISTERS
 1140 IC     =$E84D           ;INTERRUPT FLAG
 1150 IE     =$E84E           ;INTERRUPT ENABLE
 1160        ;
 1170        ;                 PROGRAM CONSTANTS
 1180 INTDIS =2               ;TO DISABLE INTERRUPTS
 1190 INTEN  =130             ;TO ENABLE INTERRUPTS
 1200        ;                 ALSO TO TEST INTERRUPT FLAG
 1210 ;*******************************************************************************
 1220        ;                 ENTRY POINT TO RE-DIRECT RAM IRQ POINTERS
 1230 ENABL  LDA CINV         ;LO IRQ POINTER PRESENT VALUE
 1240        STA IRQST        ;SAVE IT IN RESERVED BYTES
 1250        LDA CINV+1       ;HI
 1260        STA IRQST+1
 1270        SEI              ;DISABLE INTERRUPTS
 1280        LDA #<OWNCDE     ;LO START OF OWN CODE
 1290        STA CINV         ;RESET RAM POINTER
 1300        LDA #>OWNCDE     ;HI
 1310        STA CINV+1
 1320        LDA #INTEN
 1330        STA IE           ;TO ENABLE CHIP TO INTERRUPT
 1340        CLI              ;RE-ENABLE INTERRUPTS
 1350        RTS              ;AND RETURN
 1360 ;*******************************************************************************
 1370        ;                 ENTRY POINT TO RESTORE RAM IRQ POINTERS
 1380 DISABL SEI              ;DISABLE INTERRUPTS
 1390        LDA #INTDIS
 1400        STA IE           ;TO STOP CHIP FROM INTERRUPTING
 1410        LDA IRQST        ;SAVED LO IRQ POINTER VALUE
 1420        STA CINV         ;RESTORE RAM POINTER
 1430        LDA IRQST+1      ;HI
 1440        STA CINV+1
```

rather than just touching them. Also, the STOP key won't work. If a 'STOP' feature is necessary in your assembler program, it must test the key periodically itself. You cannot depend on the keyboard scan included within the interrupt routine in ROM, because it will never be entered. Instead, you must use the entry points which that routine uses. Your assembler program should perform the following subroutine calls (true for PET, VIC and 64):

* JSR $FFEA Updates TI clock and gets keypress

* JSR $FFE1 Tests STOP key pressed and, if so, sets the Z flag. BEQ to your STOP exit.

The User Port can interrupt

It is possible to enable the user port interface chip to create an interrupt when the chip receives a handshake signal. By doing this, you can remove the need for your program to await the signal. Instead, the program will get on with something else, and will only be interrupted when a handshake is received, signifying that the other machine wishes to communicate. At this point, further interrupts will be disabled by the microprocessor, your own interrupt routine will be entered, and this will handle the data transfer imposed by the other machine.

One example of how you could use the ability to interrupt is to permit two machines to share a disk drive. One machine is connected directly to it. The other accesses the disks through the first machine, and communicates via the user port. When the extension machine requires to write to a disk, it interrupts and transfers its data to the main machine. Your interrupt routine in this machine then writes to the disk. The main program is temporarily halted while this happens, and as soon as the transfer is finished it continues from where it left off.

Enable and disable

To enable the chip to interrupt the microprocessor when a handshake is received, you have to set certain bits in the Interrupt Enable Register (IE for short). By clearing them, you will disable this ability. Here are the addresses and values to store:

	IE address	Value to enable	Value to disable
* PET	59470	130	2
* VIC	37150	140	16
* 64	56589	140	16

```
1450        CLI                 ;RE-ENABLE INTERRUPTS
1460        RTS                 ;AND RETURN
1470 ;**************************************************************************
1480        ;                    ENTRY POINT WHEN AN INTERRUPT OCCURS
1490 OWNCDE LDA IC              ;INTERRUPT CONTROL
1500        TAX                 ;TO SAVE IT (ONLY NEEDED FOR CBM64)
1510        AND #INTEN          ;IRQ AND HANDSHAKE FLAGS
1520        CMP #INTEN
1530        BEQ OWNIRQ          ;THEY ARE BOTH SET
1540        JMP (IRQST)         ;GO ON TO NORMAL IRQ ENTRY
1550        ;
1560 OWNIRQ ;                    THIS IS WHERE YOUR OWN CODING SITS
1570        ;
1580        JMP IRQEND          ;TO TIDY UP AT THE END
1590 ;**************************************************************************
1600        ;                    RESERVED BYTES
1610 IRQST  .BYT 0,0            ;FOR SAVING PRESENT RAM IRQ POINTER VALUE
1620 ;**************************************************************************
1630 .END
```

```
59998 REM MEMLINK                              W.OWEN MURCOTT              REV.DEC 1983
59999 REM------------------------------------------------------------------------------
60000 DATA 32000, 41037: REM
                                                                             PET BASIC2
60010 DATAA 9,00,85,00,4C,38,7D,A9,4D,D0,02,A9,CD,85,00,20,27,7E,A5,12,48,A5,11
60020 DATA 48,20,27,7E,A5,12,48,A5,11,48,20,27,7E,A5,11,85,4F,A5,12,85,50,68,85
60030 DATA 4D,68,85,4E,68,85,4B,68,85,4C,A9,00,8D,4B,E8,AD,4C,E8,29,FE,8D,4C,E8
60040 DATA AD,4C,E8,09,E0,8D,4C,E8,A9,02,8D,4E,E8,78,AD,41,E8,AD,4C,E8,09,E0,8D
60050 DATA 4C,E8,A5,00,D0,1B,8D,43,E8,20,0B,7E,A0,07,88,D0,FD,AD,4D,E8,29,02,F0
60060 DATA F1,AD,41,E8,A2,00,A0,06,D0,30,AD,4D,E8,29,02,F0,02,D0,09,AD,4D,E8,29
60070 DATA 02,F0,F0,D0,00,AD,4C,E8,29,DF,8D,4C,E8,AE,41,E8,09,E0,8D,4C,E8,A9,FF
60080 DATA 8D,43,E8,A2,00,A0,06,D0,18,20,0B,7E,20,1C,7E,95,4B,E8,88,D0,F4,20,19
60090 DATA 7E,C9,4D,D0,22,F0,39,20,1C,7E,B5,4B,8D,41,E8,20,0B,7E,E8,88,D0,F1,20
60100 DATA 1C,7E,A5,00,48,8D,41,E8,20,0B,7E,68,C9,4D,D0,19,A9,FF,8D,43,E8,A0,00
60110 DATA 20,1C,7E,B1,4B,8D,41,E8,20,0B,7E,20,44,7E,90,F0,58,60,A9,00,8D,43,E8
60120 DATA A0,00,20,19,7E,91,4F,20,3E,7E,90,F6,58,60,AD,4C,E8,29,DF,8D,4C,E8,09
60130 DATA E0,8D,4C,E8,60,20,0B,7E,AD,4D,E8,29,02,F0,F9,AD,41,E8,60,20,F8,CD,20
60140 DATA 9F,CC,A5,07,D0,08,A5,08,D0,03,20,D2,D6,60,A2,A3,4C,57,C3,E6,4F,D0,02
60150 DATA E6,50,A5,4C,C5,4E,90,08,D0,0C,A5,4B,C5,4D,B0,06,E6,4B,D0,02,E6,4C,60
60160 DATA *
60200 DATA 32000, 40923: REM
                                                                             PET BASIC4
60210 DATA A9,00,85,00,4C,38,7D,A9,4D,D0,02,A9,CD,85,00,20,27,7E,A5,12,48,A5,11
60220 DATA 48,20,27,7E,A5,12,48,A5,11,48,20,27,7E,A5,11,85,4F,A5,12,85,50,68,85
60230 DATA 4D,68,85,4E,68,85,4B,68,85,4C,A9,00,8D,4B,E8,AD,4C,E8,29,FE,8D,4C,E8
60240 DATA AD,4C,E8,09,E0,8D,4C,E8,A9,02,8D,4E,E8,78,AD,41,E8,AD,4C,E8,09,E0,8D
60250 DATA 4C,E8,A5,00,D0,1B,8D,43,E8,20,0B,7E,A0,07,88,D0,FD,AD,4D,E8,29,02,F0
60260 DATA F1,AD,41,E8,A2,00,A0,06,D0,30,AD,4D,E8,29,02,F0,02,D0,09,AD,4D,E8,29
60270 DATA 02,F0,F0,D0,00,AD,4C,E8,29,DF,8D,4C,E8,AE,41,E8,09,E0,8D,4C,E8,A9,FF
60280 DATA 8D,43,E8,A2,00,A0,06,D0,18,20,0B,7E,20,1C,7E,95,4B,E8,88,D0,F4,20,19
60290 DATA 7E,C9,4D,D0,22,F0,39,20,1C,7E,B5,4B,8D,41,E8,20,0B,7E,E8,88,D0,F1,20
60300 DATA 1C,7E,A5,00,48,8D,41,E8,20,0B,7E,68,C9,4D,D0,19,A9,FF,8D,43,E8,A0,00
60310 DATA 20,1C,7E,B1,4B,8D,41,E8,20,0B,7E,20,44,7E,90,F0,58,60,A9,00,8D,43,E8
60320 DATA A0,00,20,19,7E,91,4F,20,3E,7E,90,F6,58,60,AD,4C,E8,29,DF,8D,4C,E8,09
60330 DATA E0,8D,4C,E8,60,20,0B,7E,AD,4D,E8,29,02,F0,F9,AD,41,E8,60,20,F5,BE,20
60340 DATA 98,BD,A5,07,D0,08,A5,08,D0,03,20,2D,C9,60,A2,A3,4C,CF,B3,E6,4F,D0,02
60350 DATA E6,50,A5,4C,C5,4E,90,08,D0,0C,A5,4B,C5,4D,B0,06,E6,4B,D0,02,E6,4C,60
60360 DATA *
60400 DATA 7168, 35378: REM
                                                                                    VIC
60410 DATA A9,00,85,00,4C,38,1C,A9,4D,D0,02,A9,CD,85,00,20,27,1D,A5,15,48,A5,14
60420 DATA 48,20,27,1D,A5,15,48,A5,14,48,20,27,1D,A5,14,85,52,A5,15,85,53,68,85
60430 DATA 50,68,85,51,68,85,4E,68,85,4F,A9,00,8D,1B,91,AD,1C,91,29,EF,8D,1C,91
60440 DATA AD,1C,91,09,E0,8D,1C,91,A9,10,8D,1E,91,78,AD,10,91,AD,1C,91,09,E0,8D
60450 DATA 1C,91,A5,00,D0,1B,8D,12,91,20,0B,1D,A0,07,88,D0,FD,AD,1D,91,29,10,F0
60460 DATA F1,AD,10,91,A2,00,A0,06,D0,30,AD,1D,91,29,10,F0,02,D0,09,AD,1D,91,29
60470 DATA 10,F0,F0,D0,00,AD,1C,91,29,DF,8D,1C,91,AE,10,91,09,E0,8D,1C,91,A9,FF
60480 DATA 8D,12,91,A2,00,A0,06,D0,18,20,0B,1D,20,1C,1D,95,4E,E8,88,D0,F4,20,19
60490 DATA 1D,C9,4D,D0,22,F0,39,20,1C,1D,B5,4E,8D,10,91,20,0B,1D,E8,88,D0,F1,20
60500 DATA 1C,1D,A5,00,48,8D,10,91,20,0B,1D,68,C9,4D,D0,19,A9,FF,8D,12,91,A0,00
60510 DATA 20,1C,1D,B1,4E,8D,10,91,20,0B,1D,20,44,1D,90,F0,58,60,A9,00,8D,12,91
60520 DATA A0,00,20,19,1D,91,52,20,3E,1D,90,F6,58,60,AD,1C,91,29,DF,8D,1C,91,09
60530 DATA E0,8D,1C,91,60,20,0B,1D,AD,1D,91,29,10,F0,F9,AD,10,91,60,20,FD,CE,20
60540 DATA 9E,CD,A5,0D,D0,08,A5,0E,D0,03,20,F7,D7,60,A2,15,4C,3A,C4,E6,52,D0,02
60550 DATA E6,53,A5,4F,C5,51,90,08,D0,0C,A5,4E,C5,50,B0,06,E6,4E,D0,02,E6,4F,60
60560 DATA *
60600 DATA 40448, 38389: REM
                                                                                  CBM64
60610 DATA A9,00,85,BD,4C,38,9E,A9,4D,D0,02,A9,CD,85,BD,20,27,9F,A5,15,48,A5,14
60620 DATA 48,20,27,9F,A5,15,48,A5,14,48,20,27,9F,A5,14,85,52,A5,15,85,53,68,85
60630 DATA 50,68,85,51,68,85,4E,68,85,4F,A9,00,8D,00,08,AD,00,08,29,00,8D,00,08
60640 DATA AD,02,DD,09,04,8D,02,DD,A9,7F,8D,0D,DD,78,AD,0D,DD,AD,00,DD,09,04,8D
60650 DATA 00,DD,A5,BD,D0,1B,8D,03,DD,20,0B,9F,A0,06,88,D0,FD,AD,0D,DD,29,10,F0
60660 DATA F1,AD,0D,DD,A2,00,A0,06,D0,30,AD,0D,DD,29,10,F0,02,D0,09,AD,0D,DD,29
60670 DATA 10,F0,F0,D0,00,AD,00,DD,29,FB,8D,00,DD,AE,0D,DD,09,04,8D,00,DD,A9,FF
60680 DATA 8D,03,DD,A2,00,A0,06,D0,18,20,0B,9F,20,1C,9F,95,4E,E8,88,D0,F4,20,19
60690 DATA 9F,C9,4D,D0,22,F0,39,20,1C,9F,B5,4E,8D,01,DD,20,0B,9F,E8,88,D0,F1,20
60700 DATA 1C,9F,A5,BD,48,8D,01,DD,20,0B,9F,68,C9,4D,D0,19,A9,FF,8D,03,DD,A0,00
60710 DATA 20,1C,9F,B1,4E,8D,01,DD,20,0B,9F,20,44,9F,90,F0,58,60,A9,00,8D,03,DD
60720 DATA A0,00,20,19,9F,91,52,20,3E,9F,90,F6,58,60,AD,00,DD,29,FB,8D,00,DD,09
60730 DATA 04,8D,00,DD,60,20,0B,9F,AD,0D,DD,29,10,F0,F9,AD,01,DD,60,20,FD,AE,20
60740 DATA 9E,AD,A5,0D,D0,08,A5,0E,D0,03,20,F7,B7,60,A2,15,4C,3A,A4,E6,52,D0,02
60750 DATA E6,53,A5,4F,C5,51,90,08,D0,0C,A5,4E,C5,50,B0,06,E6,4E,D0,02,E6,4F,60
60760 DATA *
```

You also need to do some other things so that your interrupt routine can be entered when an interrupt occurs. It involves re-directing IRQ (PET and VIC), or NMI (Commodore 64).

Redirecting interrupts

The addresses of the start of the IRQ and NMI interrupt routines in ROM are found at fixed locations in ROM on all Commodore machines. You may recall that programs in earlier articles got the address from the IRQ location and used it for machine identification – it varies from machine to machine. The microprocessor is constructed to get it automatically when an IRQ interrupt occurs. The same is true for NMI. But the trail of instructions soon breaks, and continues from a point whose address is held in RAM. Normally the address points straight back into the ROM. Because the pointer is in RAM, you can change its contents to point elsewhere.

Line 290 of 'Double Wrap Trap' actually redirects the interrupts and thereby disables the STOP key (it is restored at line 400). It changes the LO address in the RAM IRQ pointer to make it point to the location just three bytes further on past its normal re-entry point. So it skips the subroutine jump, a three-byte instruction, at that point within the IRQ routine. This jump is to the subroutine, mentioned earlier, which updates the TI clock and tests to see if the STOP key is currently depressed.

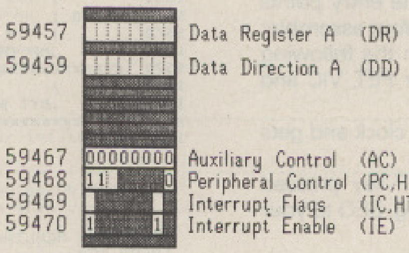
The trick of re-directing IRQ to disable 'STOP' seems to work for all Commodore machines. Unfortunately it also stops the TI clock, which your program may access, as this is updated before the STOP key test and in the same routine. It does not work on a VIC with a 'Super Expander' cartridge plugged in. IRQ is already re-directed elsewhere.

BASIC is slow. You can only alter one byte of the IRQ point from BASIC with a POKE command. This is enough for disabling the STOP key. If you tried to alter both bytes to point to a new LO-HI address, an interrupt would probably occur before the second POKE could be executed and the machine would crash. So you have to do that from an assembler program.

The interrupt trail

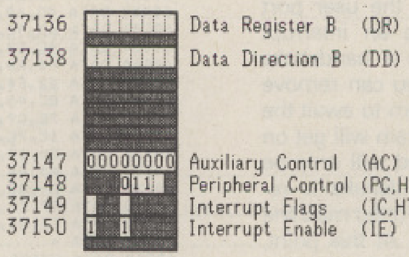
I pointed out earlier that NMI is the user port interrupt on the Commodore 64. PET and VIC use IRQ. Here are their trails. I suggest that you use a monitor cartridge, or 'Extramon' (or its equivalent) to follow the trail and see what happens at each point:

	ROM Pointer at	Points to start	Then RAM Pointer at	Points to main	Routine ends at
*PET BASIC2	$FFFE-F	$E616	$90-$91	$E62E	$E6E4
*PET BASIC4	$FFFE-F	$E442	$90-$91	$E455	$E600
*VIC	$FFFE-F	$FF72	$0314-$0315	$EABF	$EB19
*64	$FFFA-B	$FE43	$0318-$0319	$FE47	$FEBC



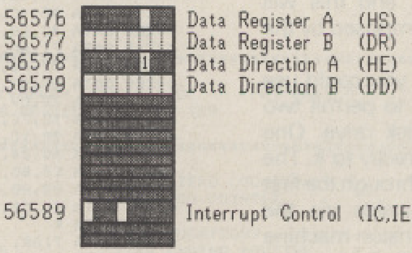
59457
Data Register A (DR)
59459
Data Direction A (DD)
59467
00000000
Auxiliary Control (AC)
59468
11
0
Peripheral Control (PC,HE,HS)
59469
Interrupt Flags (IC,HT)
59470
1
1
Interrupt Enable (IE)

Fig 1 – PET User Port Chip



37136
Data Register B (DR)
37138
Data Direction B (DD)
37147
00000000
Auxiliary Control (AC)
37148
011
Peripheral Control (PC,HE,HS)
37149
Interrupt Flags (IC,HT)
37150
1
1
Interrupt Enable (IE)

Fig 2 – VIC User Port Chip



56576
Data Register A (HS)
56577
Data Register B (DR)
56578
1
Data Direction A (HE)
56579
Data Direction B (DD)
56589
Interrupt Control (IC,IE,HT)

Fig 3 – CBM64 User Port Chip

```
59998 REM VARLINK                          W.OWEN MURCOTT             REV. DEC 1983
59999 REM-------------------------------------------------------------------------
60000 DATA 31488, 57815: REM                                              PET BASIC2
60010 DATA A9,00,85,00,4C,19,7B,A9,56,D0,02,A9,D6,85,00,20,F8,CD,20,6D,CF,85,46
60020 DATA 84,47,A9,00,8D,4B,E8,AD,4C,E8,29,FE,8D,4C,E8,AD,4C,E8,09,E0,8D,4C,E8
60030 DATA 78,A9,02,8D,4E,E8,AD,41,E8,AD,4C,E8,09,E0,8D,4C,E8,A5,00,D0,18,8D,43
60040 DATA E8,20,B0,7C,A0,07,88,D0,FD,AD,4D,E8,29,02,F0,F1,AD,41,E8,4C,85,7B,AD
60050 DATA 4D,E8,29,02,F0,02,D0,09,AD,4D,E8,29,02,F0,F0,D0,00,AD,4C,E8,29,DF,8D
60060 DATA 4C,E8,AE,41,E8,09,E0,8D,4C,E8,A9,FF,8D,43,E8,4C,AF,7B,20,C1,7C,48,20
60070 DATA BE,7C,85,07,20,BE,7C,85,08,20,BE,7C,85,42,20,BE,7C,85,43,A9,00,85,06
60080 DATA 20,C9,CF,85,46,84,47,68,C9,56,D0,30,F0,6D,A5,00,8D,41,E8,20,BE,7C,A5
60090 DATA 07,8D,41,E8,20,BE,7C,A5,08,8D,41,E8,20,BE,7C,A5,42,8D,41,E8,20,BE,7C
60100 DATA A5,43,8D,41,E8,20,B0,7C,A5,00,C9,56,D0,3F,A9,FF,8D,43,E8,A5,07,D0,09
60110 DATA A2,05,20,D6,7C,A0,00,F0,0F,A0,02,B1,44,85,20,88,B1,44,85,1F,88,B1,44
60120 DATA AA,20,C1,7C,8E,41,E8,20,B0,7C,E0,00,F0,0F,20,C1,7C,B1,1F,8D,41,E8,20
60130 DATA B0,7C,C8,CA,D0,F1,58,60,A9,00,8D,43,E8,20,BE,7C,AA,A0,00,A5,07,D0,08
60140 DATA 20,D6,7C,20,CC,7C,58,60,86,1F,38,A5,30,E5,1F,85,30,A5,31,E9,00,85,31
60150 DATA 38,A5,30,E9,02,85,50,85,32,85,1F,85,40,A5,31,E9,00,85,31,85,33,85,20
60160 DATA 85,41,C5,2F,90,0A,D0,0B,A5,30,C5,2E,90,02,D0,03,4C,55,C3,E0,00,F0,03
60170 DATA 20,CC,7C,98,18,65,1F,85,1F,90,02,E6,20,A0,00,A9,2C,91,1F,85,04,A9,3A
60180 DATA 85,03,A9,98,85,0B,A5,77,A4,78,85,48,84,49,A5,40,A4,41,85,77,84,78,20
60190 DATA 67,D3,20,BD,D6,20,E2,C8,A5,48,A4,49,85,77,84,78,58,60,AD,4C,E8,29,DF
60200 DATA 8D,4C,E8,09,E0,8D,4C,E8,60,20,B0,7C,AD,4D,E8,29,02,F0,F9,AD,41,E8,60
60210 DATA 20,BE,7C,91,1F,C8,CA,D0,F7,60,A5,44,85,1F,A5,45,85,20,60
60220 DATA *
60300 DATA 31488, 57488: REM                                              PET BASIC4
60310 DATA A9,00,85,00,4C,19,7B,A9,56,D0,02,A9,D6,85,00,20,F5,BE,20,2B,C1,85,46
60320 DATA 84,47,A9,00,8D,4B,E8,AD,4C,E8,29,FE,8D,4C,E8,AD,4C,E8,09,E0,8D,4C,E8
```

Add your own

You can change the RAM pointers to point to your own user port routines, written in assembler, which will then be executed each time an interrupt occurs. When you change the pointers, you must disable IRQ interrupts first, using SEI. It would be disastrous if an interrupt happened before the change was completed. Be systematic and preserve the present content of the pointers so that they can be restored. Then re-enable interrupts with CLI.

I have given some sample code, labelled 'IRQLINK', at the end of this article which shows how to do it. It allows your own interrupt routines to be enabled/disabled at will by using alternative entry points 'ENABL' and 'DISABL'.

Beware of cassette tape transfers. They sometimes have a nasty habit of not working if the IRQ pointers do not have their normal values at the start. Also they reset the pointers back to their normal values at the end. Then your interrupt routine will never be entered. So avoid cassette tape usage if you alter the pointers, or make sure that you reset them before and after tape transfers. I have not yet had a chance to find all of the 'nasties' which lie in store for you with NMI pointers on the CBM64.

What to do on interrupt

Once you have redirected the interrupt trail to run through your own routine, remember that all interrupts will follow it. You need to be able to distinguish those which have come from the user port interface chip, and those which have arisen from other sources. The latter must be immediately redirected back to the normal interrupt processing in ROM.

If the interrupt has stemmed from the user port interface chip, bit 7 of the Interrupt Flag Register (Interrupt Control Register on the Commodore 64) will be set. When it is caused by a handshake, the appropriate interrupt flag will also be set in that register. Logical AND, using the value for enabling the interrupt (see above), will detect it (look at label 'OWNCDE' in my sample code with this article). You can then take action accordingly, and when it is complete go on to the interrupt end address in ROM where the stack is tidied (given above).

```
60330 DATA 78,A9,02,8D,4E,E8,AD,41,E8,AD,4C,E8,09,E0,8D,4C,E8,A5,00,D0,18,8D,43
60340 DATA E8,20,B0,7C,A0,07,88,D0,FD,AD,4D,E8,29,02,F0,F1,AD,41,E8,4C,85,7B,AD
60350 DATA 4D,E8,29,02,F0,02,D0,09,AD,4D,E8,29,02,F0,F0,D0,00,AD,4C,E8,29,DF,8D
60360 DATA 4C,E8,AE,41,E8,09,E0,8D,4C,E8,A9,FF,8D,43,E8,4C,AF,7B,20,C1,7C,48,20
60370 DATA BE,7C,85,07,20,BE,7C,85,08,20,BE,7C,85,42,20,BE,7C,85,43,A9,00,85,06
60380 DATA 20,87,C1,85,46,84,47,68,C9,56,D0,30,F0,6D,A5,00,8D,41,E8,20,BE,7C,A5
60390 DATA 07,8D,41,E8,20,BE,7C,A5,08,8D,41,E8,20,BE,7C,A5,42,8D,41,E8,20,BE,7C
60400 DATA A5,43,8D,41,E8,20,B0,7C,A5,00,C9,56,D0,3F,A9,FF,8D,43,E8,A5,07,D0,09
60410 DATA A2,05,20,D6,7C,A0,00,F0,0F,A0,02,B1,44,85,20,88,B1,44,85,1F,88,B1,44
60420 DATA AA,20,C1,7C,8E,41,E8,20,B0,7C,E0,00,F0,0F,20,C1,7C,B1,1F,8D,41,E8,20
60430 DATA B0,7C,C8,CA,D0,F1,58,60,A9,00,8D,43,E8,20,BE,7C,AA,A0,00,A5,07,D0,08
60440 DATA 20,D6,7C,20,CC,7C,58,60,86,1F,38,A5,30,E5,1F,85,30,A5,31,E9,00,85,31
60450 DATA 38,A5,30,E9,02,85,30,85,32,85,1F,85,40,A5,31,E9,00,85,31,85,33,85,20
60460 DATA 85,41,C5,2F,90,0A,D0,0B,A5,30,C5,2E,90,02,D0,03,4C,CD,B3,E0,00,F0,03
60470 DATA 20,CC,7C,98,18,65,1F,85,1F,90,02,E6,20,A0,00,A9,2C,91,1F,85,04,A9,3A
60480 DATA 85,03,A9,98,85,0B,A5,77,A4,78,85,48,84,49,A5,40,A4,41,85,77,84,78,20
60490 DATA B6,C5,20,18,C9,20,65,B9,A5,48,A4,49,85,77,84,78,58,60,AD,4C,E8,29,DF
60500 DATA 8D,4C,E8,09,E0,8D,4C,E8,60,20,B0,7C,AD,4D,E8,29,02,F0,F9,AD,41,E8,60
60510 DATA 20,BE,7C,91,1F,C8,CA,D0,F7,60,A5,44,85,1F,A5,45,85,20,60
60520 DATA *


10 REM      VARLINK      W.OWEN MURCOTT                          REV. DEC 1983
59999 REM---------------------------------------------------------------------
60600 DATA 7168, 51350: REM                   VIC - ALTERNATIVE VERSION OF VARLINK
60610 DATA A9,00,85,00,4C,19,1C,A9,56,D0,02,A9,D6,85,00,20,FD,CE,20,8B,D0,85,49
60620 DATA 84,4A,A9,00,8D,1B,91,AD,1C,91,29,EF,8D,1C,91,AD,1C,91,09,E0,8D,1C,91
60630 DATA 78,A9,10,8D,1E,91,AD,10,91,AD,1C,91,09,E0,8D,1C,91,A5,00,D0,18,8D,12
60640 DATA 91,20,B0,1D,A0,07,88,D0,FD,AD,1D,91,29,10,F0,F1,AD,10,91,4C,85,1C,AD
60650 DATA 1D,91,29,10,F0,02,D0,09,AD,1D,91,29,10,F0,F0,D0,00,AD,1C,91,29,DF,8D
60660 DATA 1C,91,AE,10,91,09,E0,8D,1C,91,A9,FF,8D,12,91,4C,AF,1C,20,C1,1D,48,20
60670 DATA BE,1D,85,0D,20,BE,1D,85,0E,20,BE,1D,85,45,20,BE,1D,85,46,A9,00,85,0C
60680 DATA 20,E7,D0,85,49,84,4A,68,C9,56,D0,30,F0,6D,A5,00,8D,10,91,20,BE,1D,A5
60690 DATA 0D,8D,10,91,20,BE,1D,A5,0E,8D,10,91,20,BE,1D,A5,45,8D,10,91,20,BE,1D
60700 DATA A5,46,8D,10,91,20,B0,1D,A5,00,C9,56,D0,3F,A9,FF,8D,12,91,A5,0D,D0,09
60710 DATA A2,05,20,D6,1D,A0,00,F0,0F,A0,02,B1,47,85,23,88,B1,47,85,22,88,B1,47
60720 DATA AA,20,C1,1D,8E,10,91,20,B0,1D,E0,00,F0,0F,20,C1,1D,B1,22,8D,10,91,20
60730 DATA B0,1D,C8,CA,D0,F1,58,60,A9,00,8D,12,91,20,BE,1D,AA,A0,00,A5,0D,D0,08
60740 DATA 20,D6,1D,20,CC,1D,58,60,86,22,38,A5,33,E5,22,85,33,A5,34,E9,00,85,34
60750 DATA 38,A5,33,E9,02,85,33,85,35,85,22,85,43,A5,34,E9,00,85,34,85,36,85,23
60760 DATA 85,44,C5,32,90,0A,D0,0B,A5,33,C5,31,90,02,D0,03,4C,35,C4,E0,00,F0,03
60770 DATA 20,CC,1D,98,18,65,22,85,22,90,02,E6,23,A0,00,A9,2C,91,22,85,08,A9,3A
60780 DATA 85,07,A9,98,85,11,A5,7A,A4,7B,85,4B,84,4C,A5,43,A4,44,85,7A,84,7B,20
60790 DATA 8D,D4,20,E2,D7,20,DA,C9,A5,4B,A4,4C,85,7A,84,7B,58,60,AD,1C,91,29,DF
60800 DATA 8D,1C,91,09,E0,8D,1C,91,60,20,B0,1D,AD,1D,91,29,10,F0,F9,AD,10,91,60
60810 DATA 20,BE,1D,91,22,C8,CA,D0,F7,60,A5,47,85,22,A5,48,85,23,60
60820 DATA *

60600 DATA 6656, 51300: REM                                                    VIC
60610 DATA A9,00,85,00,4C,19,1A,A9,56,D0,02,A9,D6,85,00,20,FD,CE,20,8B,D0,85,49
60620 DATA 84,4A,A9,00,8D,1B,91,AD,1C,91,29,EF,8D,1C,91,AD,1C,91,09,E0,8D,1C,91
60630 DATA 78,A9,10,8D,1E,91,AD,10,91,AD,1C,91,09,E0,8D,1C,91,A5,00,D0,18,8D,12
60640 DATA 91,20,B0,1B,A0,07,88,D0,FD,AD,1D,91,29,10,F0,F1,AD,10,91,4C,85,1A,AD
60650 DATA 1D,91,29,10,F0,02,D0,09,AD,1D,91,29,10,F0,F0,D0,00,AD,1C,91,29,DF,8D
60660 DATA 1C,91,AE,10,91,09,E0,8D,1C,91,A9,FF,8D,12,91,4C,AF,1A,20,C1,1B,48,20
60670 DATA BE,1B,85,0D,20,BE,1B,85,0E,20,BE,1B,85,45,20,BE,1B,85,46,A9,00,85,0C
60680 DATA 20,E7,D0,85,49,84,4A,68,C9,56,D0,30,F0,6D,A5,00,8D,10,91,20,BE,1B,A5
60690 DATA 0D,8D,10,91,20,BE,1B,A5,0E,8D,10,91,20,BE,1B,A5,45,8D,10,91,20,BE,1B
60700 DATA A5,46,8D,10,91,20,B0,1B,A5,00,C9,56,D0,3F,A9,FF,8D,12,91,A5,0D,D0,09
60710 DATA A2,05,20,D6,1B,A0,00,F0,0F,A0,02,B1,47,85,23,88,B1,47,85,22,88,B1,47
60720 DATA AA,20,C1,1B,8E,10,91,20,B0,1B,E0,00,F0,0F,20,C1,1B,B1,22,8D,10,91,20
60730 DATA B0,1B,C8,CA,D0,F1,58,60,A9,00,8D,12,91,20,BE,1B,AA,A0,00,A5,0D,D0,08
60740 DATA 20,D6,1B,20,CC,1B,58,60,86,22,38,A5,33,E5,22,85,33,A5,34,E9,00,85,34
60750 DATA 38,A5,33,E9,02,85,33,85,35,85,22,85,43,A5,34,E9,00,85,34,85,36,85,23
60760 DATA 85,44,C5,32,90,0A,D0,0B,A5,33,C5,31,90,02,D0,03,4C,35,C4,E0,00,F0,03
60770 DATA 20,CC,1B,98,18,65,22,85,22,90,02,E6,23,A0,00,A9,2C,91,22,85,08,A9,3A
60780 DATA 85,07,A9,98,85,11,A5,7A,A4,7B,85,4B,84,4C,A5,43,A4,44,85,7A,84,7B,20
60790 DATA 8D,D4,20,E2,D7,20,DA,C9,A5,4B,A4,4C,85,7A,84,7B,58,60,AD,1C,91,29,DF
60800 DATA 8D,1C,91,09,E0,8D,1C,91,60,20,B0,1B,AD,1D,91,29,10,F0,F9,AD,10,91,60
60810 DATA 20,BE,1B,91,22,C8,CA,D0,F7,60,A5,47,85,22,A5,48,85,23,60
60820 DATA *
60900 DATA 39936, 56263: REM                                                 CBM64
60910 DATA A9,00,85,BD,4C,19,9C,A9,56,D0,02,A9,D6,85,BD,20,FD,AE,20,8B,B0,85,49
60920 DATA 84,4A,A9,00,8D,EC,07,AD,EC,07,29,00,8D,EC,07,AD,02,DD,09,04,8D,02,DD
60930 DATA 78,A9,7F,8D,0D,DD,AD,0D,DD,AD,00,DD,09,04,8D,00,DD,A5,BD,D0,18,8D,03
60940 DATA DD,20,B0,9D,A0,06,88,D0,FD,AD,0D,DD,29,10,F0,F1,AD,0D,DD,4C,85,9C,AD
60950 DATA 0D,DD,29,10,F0,02,D0,09,AD,0D,DD,29,10,F0,F0,D0,00,AD,00,DD,29,FB,8D
60960 DATA 00,DD,AE,0D,DD,09,04,8D,00,DD,A9,FF,8D,03,DD,4C,AF,9C,20,C1,9D,48,20
60970 DATA BE,9D,85,0D,20,BE,9D,85,0E,20,BE,9D,85,45,20,BE,9D,85,46,A9,00,85,0C
60980 DATA 20,E7,B0,85,49,84,4A,68,C9,56,D0,30,F0,6D,A5,BD,8D,01,DD,20,BE,9D,A5
60990 DATA 0D,8D,01,DD,20,BE,9D,A5,0E,8D,01,DD,20,BE,9D,A5,45,8D,01,DD,20,BE,9D
61000 DATA A5,46,8D,01,DD,20,B0,9D,A5,BD,C9,56,D0,3F,A9,FF,8D,03,DD,A5,0D,D0,09
61010 DATA A2,05,20,D6,9D,A0,00,F0,0F,A0,02,B1,47,85,23,88,B1,47,85,22,88,B1,47
61020 DATA AA,20,C1,9D,8E,01,DD,20,B0,9D,E0,00,F0,0F,20,C1,9D,B1,22,8D,01,DD,20
61030 DATA B0,9D,C8,CA,D0,F1,58,60,A9,00,8D,03,DD,20,BE,9D,AA,A0,00,A5,0D,D0,08
61040 DATA 20,D6,9D,20,CC,9D,58,60,86,22,38,A5,33,E5,22,85,33,A5,34,E9,00,95,34
61050 DATA 38,A5,33,E9,02,85,33,85,35,85,22,85,43,A5,34,E9,00,85,34,85,36,85,23
61060 DATA 85,44,C5,32,90,0A,D0,0B,A5,33,C5,31,90,02,D0,03,4C,35,A4,E0,00,F0,03
61070 DATA 20,CC,9D,98,18,65,22,85,22,90,02,E6,23,A0,00,A9,2C,91,22,85,08,A9,3A
61080 DATA 85,07,A9,98,85,11,A5,7A,A4,7B,85,4B,84,4C,A5,43,A4,44,85,7A,84,7B,20
61090 DATA 8D,B4,20,E2,B7,20,DA,A9,A5,4B,A4,4C,85,7A,84,7B,58,60,AD,00,DD,29,FB
61100 DATA 8D,00,DD,09,04,8D,00,DD,60,20,B0,9D,AD,0D,DD,29,10,F0,F9,AD,01,DD,60
61110 DATA 20,BE,9D,91,22,C8,CA,D0,F7,60,A5,47,85,22,A5,48,85,23,60
61120 DATA *
```

commodore

Superbase

SuperBase, the complete information storage and control system, is ideal for any business, office or professional environment where records are kept... The very latest design techniques make SuperBase the last word in database technology, with all the power you need to control today's information, for tomorrow's needs! That's why SuperBase is...

The Ultimate CBM Database Manager

Key SuperBase features include fast key access, large record size, user-definable inputs, outputs, record formats... multiple screens, multiple selection criteria... word processor links, sorting, calendar, calculator... program or menu control, on-line or batch processing, transaction linking... and it's available NOW for Commodore models 700, 8096 and 64!

Superscript

A Commodore enthusiast wanted a word processor that was simple, fast, and easy to use. He wanted to handle up to 20,000 characters of text, to use a wide screen format of up to 240 characters, with full window scrolling in all directions, and be able to use the screen while printing. He wanted a word processor at a reasonable price. The enthusiast, Simon Tranmer, couldn't find one, so he wrote...

The Ultimate CBM Word Processor

SuperScript does everything he wanted... and much more. It provides a complete document preparation and storage system, making optimum use of memory and disk space. In short, it provides all the advantages of a dedicated professional word processor... And now SUPERSCRIPT II is available for Commodore models 700 and 8096, with a host of new features including arithmetic, selective sort, column move... and the 700 series version even includes a spelling-checker!

FASTEST SERVICE – LOWEST PRICES!

SUPERSCRIPT II (Commodore 700)	~~£450.00~~	£369.57
SUPERBASE (Commodore 700)	~~£450.00~~	£369.57
DTL COMPILER (Commodore 700)	~~£99.50~~	£94.78
MASTER 700 85 new commands (Commodore 700)		£295.00
COMMODORE 8096		
SUPERSCRIPT II (CBM 8096)	~~£395.00~~	£326.09
SUPERBASE (CBM 8096)	~~£450.00~~	£369.57
MEMORY UPGRADE (converts 8032 to 8096)	~~£300.00~~	£250.00
PM96 Memory Management/Toolkit etc	~~£89.50~~	£86.91
COMMODORE 2000/8000		
SUPERSCRIPT (CBM 2000/3000/4000/8000)	~~£240.00~~	£195.65
SUPERSPELL (CBM 2000/3000/4000/8000)	~~£150.00~~	£117.39
MASTER (CBM 4000/8000/8096)	~~£225.00~~	£195.65
VISICALC (CBM 2000/3000/4000/8000)	~~£175.00~~	£140.00
KRAM keyed disk access (CBM 3000/4000/8000)	~~£89.50~~	£86.91
DTL COMPILER (CBM 2000/3000/4000/8000)	~~£99.50~~	£94.78
COMMAND-O 39 toolkit commands (CBM 4000/8000)		£50.00
COMMODORE 64		
SUPERBASE 64 database (disk)	~~£86.91~~	£76.52
VIZAWRITE 64 word-processor (disk)	~~£69.52~~	£59.13
VIZAWRITE 64 (cartridge) for tape or disk	~~£78.22~~	£65.22
VIZASPELL 64 disk dictionary/spelling checker	~~£52.13~~	£51.30
VIZAWRITE + VIZASPELL combined (disk)	~~£86.91~~	£73.91
MASTER 64 Basic IV + 85 new commands (disk)	~~£125.00~~	£100.00
DTL COMPILER 64 (disk)	~~£99.50~~	£94.78
DTL COMPILER 64 (tape)	~~£34.74~~	£32.13
TOOL 64 Toolkit/DOS Support etc. (cartridge)	~~£43.43~~	£40.83
PRACTICALC 64 Spreadsheet (disk or tape)		£38.70

PRICES SHOWN EXCLUDE 15% VAT, AND ARE CORRECT ON GOING TO PRESS. ORDER BY POST OR TELEPHONE, USING CHEQUE, ACCESS, BARCLAY CARD OR OFFICIAL ORDER. DESPATCH IS BY RETURN 1ST CLASS POST, AND FREE EXCEPT FOR OVERSEAS AND CREDIT ORDERS. PRODUCT INFORMATION IS AVAILABLE ON REQUEST. [REF A26]

Calco Software

LAKESIDE HOUSE, KINGSTON HILL, SURREY KT2 7QT. TEL 01-546-7256

GAMES
ADVENTURES
MACHINE CODE AIDS

THE
COMMODORE
64
PROGRAM
BOOK

This sparkling collection of programs uses the full colour and sound capabilities of your **64**.
Seek treasure in the
'Forbidden City'
pilot yourself with
'Flight Simulation'
use a versatile assembler/disassembler.

£4.95

All good bookshops *or from*

PHOENIX
PUBLISHING ASSOCIATES
14 VERNON ROAD BUSHEY
HERTFORDSHIRE WD2 2JL
TEL WATFORD 32109

£4.95 plus 55p P&P

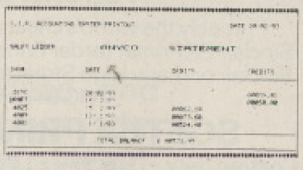
NAME ....
ADDRESS ....
....
.... POSTCODE ....

NOW AVAILABLE ON DISC

For VIC 20 and CBM 64 Users

SIP ACCOUNTING SYSTEM

Highly comprehensive program designed for 16K, 24K, VIC20 & Printer, 40 col VIC20, CBM 64. Makes an ideal introduction for you and your staff to the world of computer accounts.



Features include:

- Menu driven – simplicity to use!
- Up to 250 accounts per tape
- Day book
- Sales and purchase ledger (or just 1 type)
- Invoice print module available as extra.
- Statements print (for all or just one company)
- Overdue account statements (as above)
- End period carry on to next data tape
- Cash summary – debitors and creditors
- VAT entry (net or gross)
- PLUS many, many more features – all in ONE program.

SIP/AC20 – VIC20 16/24K Tape Based
SIP/DC20 – VIC20 16/24K Disc Based
SIP/AC40 – VIC20 16/24K + 40 column card
SIP/AC64 – CBM64 Tape Based
SIP/DC64 – CBM64 Disc Based

Tape Version £24.95 + VAT
Disc Version £29.95 + VAT

Price includes comprehensive manual (+ data tape for tape versions).

1515/1525/1526/GP 100 VC printer required for all programs.

Printer plinths

– designed to save space, improve paper flow, and tidy stray cables, has anti-vibration mounting, superb design in high impact smoked Perspex.

NEW LOW PRICE

SIP/P1515 for VC 1515 and GP 80 ~~£17.95~~ £12.95 + VAT
SIP/P1525 for VC 1525 and GP 100 ~~£18.95~~ £13.95 + VAT

INVOICE PRINT MODULE

Allows your own formating of invoices, remittance advices and credit notes can stand alone or work with SIP Accounting System, updating data files.

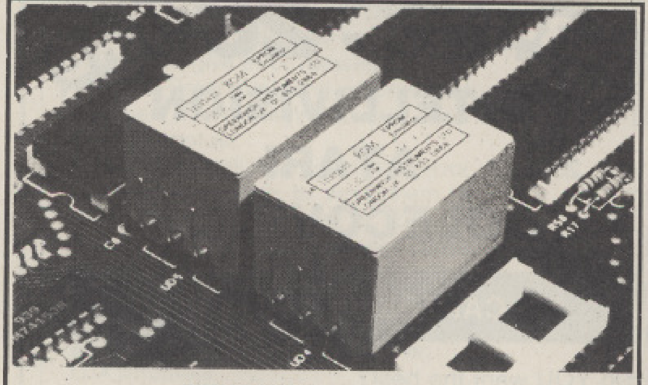
SIP/CPM20 – VIC20 Tape Based
SIP/DPM20 – VIC20 Disc Based
SIP/CPM64 – CBM64 Tape Based
SIP/DPM64 – CBM64 Disc Based

Tape Version £24.95 + VAT
Disc Version £29.95 + VAT

Please specify machine size when ordering

Available direct or from leading Software dealers. Send your orders or for further information please write or telephone:

Shore Industrial Plastics Ltd, dept c c
1-13 Corsham Street, London N1 6DP.
Telephone: 01-250 1978.
Telex: 943763 Ref. SHM



INSTANT ROM (Commodore Approved)

Greenwich Instruments' ROM/EPROM Emulators are non-volatile memory modules which plug into any ROM/EPROM socket. When the power is switched off, data is retained for up to 10 years. Emulators from 2 Kbytes to 32Kbytes are available.

In the PET, a 4Kbyte Emulator can be fitted in the 9000 or A000 socket, and used for fast program development. Basic or Machine-code programs can be stored permanently.

GR2532 4Kbyte Emulator	£56.00
Adaptor GA1 (essential for PET users)	£ 6.00

PETCLOCK (Commodore Approved)

PETCLOCK plugs into any Commodore machine with User-Port, and gives time (hour/minute/second) and date (year/month/date/day of week). Battery backup – accuracy is maintained when the power is off.

GCC1 PETCLOCK	£62.00

G-ROM E

A 4 Kbyte EPROM which runs, at switch-on, any Basic or Machine-code program stored in INSTANT ROM, eliminating the need for tape or disc. Basic programs can be stored with a few key-strokes.

Some powerful utilities are included for program revival. PET's power-up memory test is made non-destructive, and UN-NEW us provided. A program for reading Date and time from PETCLOCK is also included.

G-ROM E (specify type of PET)	£25.00

Postage (£1.00) and VAT are extra. Leaflets are available.

GREENWICH INSTRUMENTS LIMITED
THE CRESCENT, MAIN ROAD, SIDCUP, KENT DA14 6NW
Telephone: 302 4931 – Telex: 896691 Attn. GIL

---

from small systems....

IBM 80 CARD

Expand the capability of your IBM PC with our CP/M 80 second processor card.

- True CP/M 80 not an emulation.
- Built in Corvus hard disk interface with multi user capability.
- Drive "M" utility makes RAM behave like a super fast disk drive.
- Files generated under CP/M 80 and 86 are identical in structure and are interchangeable between operating systems.
- File transfer utility between PC DOS and CP/M 6 MHz version £265

PET CP/M £495

The **SOFTBOX** allows the PET to run under the world's most popular operating system CP/M 80.

- Built in RS232 and CORVUS hard disk interfaces.
- Operates with any 2000, 3000, 4000, 8000 system.
- Z80 cpu running at 4 MHz with no wait states.
- 64K RAM, full documentation, free copy of CP/M 80.
- Will run any standard CP/M 80 software.

IEEE-488 INTERFACES

B300
Bidirectional IEEE-488-RS232 interface 40 char input buffer, full handshake, etc etc £186

C100
Unidirectional IEEE-488 to RS232 .... £120

A100
IEEE-488 to Centronics/Anadex Parallel £106

GPI 1000
Z80 based bidirectional IEEE-488 to RS232 with a choice of input buffering up to 59K £475

TV/VIDEO interface
Reproduces the content of the PET screen on a TV or video monitor £46

RS232 to 20 mA current loop adaptor £25

PET HARD DISKS £495

The **HARDBOX** is the intelligent controller that lets you add a CORVUS hard disk drive to your Commodore computer.

- PET DOS 1 and 2 compatibility.
- Multi-user capability with file and record locking, passwords.
- 16 Mb max file size and up to 65535 records per relative file.
- 2000 files on 6 Mb drive.
- Access to 6, 10, 20 Mb drives with video tape backup.

SIRIUS/VICTOR 9000 CARD

This card now being manufactured under licence by Sirius Systems Technology allows the Sirius/Victor to run any standard CP/M 80 program without modification.

- Specification as per the IBM 80 CARD 6 MHz version £199

DEVELOPMENT TOOLS

8048 family in-circuit emulator	£1100
8748 Programming card	£130
Cross Assemblers for most popular microprocessors	£145
P+T 488 S100 to IEEE-488 controller card	£355

Small Systems also carry a comprehensive range of microcomputer software. For detailed information on this or any of the above products ring 01-328 7145.

DEALER ENQUIRIES WELCOME

small systems engineering limited
2-4 Canfield Place, London, NW6 3BT Tel: 328 7145 Telex: 264538

Anger Productions

COMMODORE 64 SOFTWARE

Flight Simulator

Pilot your own aircraft to a wide choice of airports in U.K. Magnificent graphics. Requires joystick.

Cassette game £9.95p.

CBM 64 Assembler

Write, read and copy your own machine code programs.

Cassette £6.95p.

Just released-GOLF

Play golf on this 18 hole par 72 course. Challenging game for all levels. Improve your handicap at home:

Cassette £7.50p.

Now also available on disk £2 extra

Lifetime replacement guarantee

Mail order only to:

Anger Productions 14 The Oval, Broxbourne, EN10 6DQ.

Flight ☐ **£9.95** Assembler ☐ **£6.95** Golf ☐ **£7.50**

NAME ....

ADDRESS ....

Cut out coupon, tick which program(s) required and send to us with remittance

---

VIC PRINTER

VIC-20 CBM-64

FOR ONLY £68.95

Probably the world's cheapest VIC/64 Printer! Put a Sinclair ZX Printer (order Printer and Power supply from Sinclair or many High Street stores – R.R.P. **£48**) on your VIC/64 using the

SOFTEX PRINTERFACE

Costing only . . . £19.95+£1 P&P.
Complete system . . . £68.95+£2.95 P&P.
Alphacom 32 Printer System . . . £79.90+£1.95 P&P

- Very high resolution graphics (higher than VIC/64).
- Full VIC/64 character set+user-defined graphic characters.
- 43 Colomn Printer with superb formatting facilities.
- Operating commands same as Commodore VIC/64 printer.
- Simple to use! No extras required.
- The Interface also fits the new Alphacom 32 printer (RRP £59.95)

Send orders/enquiries (dealer enquiries welcome) to:

SOFTEX COMPUTERS
Dept C4, 37 Wheaton Road,
Bournemouth BH7 6LH.
Tel: 0202 422028

BANK OF ENGLAND
£10
£10
TEN POUNDS

DON'T BURN YOUR MONEY

HIRE

YOUR VIC-20 SOFTWARE
CASSETTE HIRE ONLY £1.40 (inc P&P) per fortnight
CARTRIDGE HIRE ONLY £1.50 (inc P&P) per fortnight
MEMBERSHIP FEE ONLY £10.00 FOR 2 YEARS

Send Membership Fee on FULL money back approval or send large SAE for catalogue and further details.

To: VIC-20 USERS SOFTWARE LIBRARY
(Dept. C.C.)
11 NEWARK ROAD,
BREADSALL ESTATE
DERBY DE2 4DJ.

HIRE VIC 20 HIRE

INTELLIVISION

2600 ATARI 400/800

COLECOVISION

CARTRIDGE LIBRARY

Do YOU want the best?

Then get it with **M.D.M.** the fastest growing cartridge library in the country — now read on.

- ★ Hire charges from 17½p per day.
- ★ Latest arcade-type games from America.
- ★ New titles added regularly.
- ★ Fast reliable service.
- ★ Life membership now **£10**.
- ★ Members eligible for generous discounts (hardware and software).
- ★ Hire what and when you like.
- ★ High score charts.
- ★ No cartridge is unobtainable.

JOIN NOW on money back approval send S.A.E. or ring 0282 697305 to:

MDM Home Computer Services,
dept 6. 20 Napier St., Nelson,
Lancs. BB9 0SN.

Features of the 64

More useful ideas and information about the Commodore 64, including how to use the built in error messages of the 64 and interesting effects created by the SID chip. But first, how to use the interrupt generated by the Raster Compare register.

When writing machine code routines, you sometimes require an error message to be displayed if a check in your program creates one. Most of the Basic and Kernal routines will create their own messages if certain values are not to their liking. But you may want to test values and give error messages out of bounds. There are some routines that are there for displaying certain messages but not all.

Here we will list all of the error messages and how to send them. It must be noted that there is no error number zero. Any error message above $1E will be displayed as a weird character and any error number above $7F will be ignored. To display a certain error, the machine code is as follows:

```
LDX #number
JMP $A437
e.g. LDX #$14
     JMP $A437
```

Will display the message:
?DIVISION BY ZERO ERROR

The address given for each message is the address in memory where the start of the message appears.

MESSAGE	MESSAGE NUMBER	ADDRESS OF MESSAGE
TOO MANY FILES	$01	$A19E
FILE OPEN	$02	$A1AC
FILE NOT OPEN	$03	$A1B5
FILE NOT FOUND	$04	$A1C2
DEVICE NOT PRESENT	$05	$A1D0
NOT INPUT FILE	$06	$A1E2
NOT OUTPUT FILE	$07	$A1F0
MISSING FILE NAME	$08	$A1FF
ILLEGAL DEVICE NUMBER	$09	$A210
NEXT WITOUT FOR	$0A	$A225
SYNTAX	$0B	$A235
RETURN WITHOUT GOSUB	$0C	$A23B
OUT OF DATA	$0D	$A24F
ILLEGAL QUANTITY	$0E	$A25A
OVERFLOW	$0F	$A26A
OUT OF MEMORY	$10	$A272
UNDEF'D STATEMENT	$11	$A27F
BAD SUBSCRIPT	$12	$A290
REDIM'D ARRAY	$13	$A29D
DIVISION BY ZERO	$14	$A2AA
ILLEGAL DIRECT	$15	$A2BA
TYPE MISMATCH	$16	$A2C8
STRING TOO LONG	$17	$A2D5
FILE DATA	$18	$A2E4
FORMULA TOO COMPLEX	$19	$A2ED
CAN'T CONTINUE	$1A	$A300
UNDEF'D FUNCTION	$1B	$A30E
VERIFY	$1C	$A31E
LOAD	$1D	$A324
BREAK	$1E	$A383

'SIMPLY WRITE': the kind of word processor you didn't think you could afford. Some £300 programs have fewer facilities. Tape or disk; any printer; any 40 or 80 column PET. Needs 16K. **Tape £40, disk £45.**

'SIMPLY FILE' Records System (DBMS). Selects by any key. Prints alphabetical lists, mailing labels, columnar reports of all or selected records. Calculates between fields. Totals, averages columns. Works with 'Simply Write'. Fast, easy, robust and very, very versatile. Disk £65.

GOTTA PET? ADDA VIC! High resolution graphics, programmable characters, colour and sound for your PET/CBM system? All this PLUS a complete extra computer using your PET's disk drives, printer etc? Under £200 including VIC computer and our 'SIMPLY LINK' PET-VIC link system.

for PET
professional computer
3032 Series

A WINDOW ON YOUR DISK! Our 'Simply Recover' disk file repair kit (4040 only at present) will allow you to save crashed files, append BASIC or m/c subroutines, change disk names and IDs, devise protection systems, etc. Disk & detailed instructions £17.

ZYGIAN INVADERS. Super second generation machine code invaders game.

Tape £6, disk £7.50

ASTEROID PATROL. Classic game with sound effects, 9 levels of play, hyperspace jump etc. Tape £6, disk £7.50

ADD VAT TO PRICES PLEASE, BUT ALL INCLUDE P&P. SEND FOR MORE DETAILS, MORE ITEMS, AND GET OUR FREE 'MICROMAIL' PET/VIC NEWSLETTER.

Simple Software Ltd.
15 Havelock Rd., Brighton.
Sussex BN1 6GL
Tel: (0273) 504879

Special Offer to C.C.I. readers

Why pay £6 – £60 for an Assembler when you can get one for £4.49

IMPULSE COMPUTERS

Presents
for the commodore 64

"MIGHTYMON"

CHEAPEST ON THE MARKET!!! by **CLIVE WRIGHT.**

FEATURES INCLUDE:–
Full Assembly/Disassembly, Monitor, Editing Facilities, Copying, Filling, ASC II Input, Loading/Saving and many other useful commands.
LOADING TIME – Approximately 2½ minutes from tape.
TWO VERSIONS – One at $8000 – $9400. One at $1000 – $2400. Both supplied on the same tape.
HOW TO OBTAIN – Just fill in the coupon below and send with a cheque/PO to the address at the bottom of this advert, made out for £4.49, and the cassette and instructions will be sent to you by return of post. VAT and P&P included in the price. Cheques/P.Os to **IMPULSE COMPUTERS.**
DEALERS' ENQUIRIES WELCOME – Special discounts on quantity orders.
COMING SOON – Manoeuvre 64 (an arcade game); 64SPEAK (a cheap speech unit), Software for the ELAN ENTERPRISE, ROM SERVICE (your own M/C programs on cartridge).
PROGRAMS WANTED – Any good M/C programs for '64/BBC/ELAN; 35% Royalties.
Further information on receipt of an S.A.E. at the address below

Please send me a †Copy of MIGHTYMON/Further information, I enclose †£4.49/an S.A.E.
Name ______________________ No credit card facilities as yet
Address ______________________
____
______________ Post Code: ______________
†– Delete as applicable. Our Address: 28, Askerfield Avenue, Allestree, Derby, DE3 2SU.

Low price high quality software for Commodore 32K Pet & 64

Integrated accounting systems, Purchase ledger, Sales ledger, Invoice printing, Statements, Trade and early settlement discounts, Payroll with SSP and seven overtime/piece work rates, Stock control, Cash Book, Nominal ledger, will complete audit trail etc etc.

Purchase & Sales Control £80.00 + VAT

Runs both purchase and sales ledgers with optional circulation of VAT from the gross or nett amount, analysis by accounting period, "Due for payment report," totals for NETT VAT and gross. Print invoices on your own stationery laid out according to your own instructions. Suitable for small businesses only. Any 32K Pet or 64.

Stock Control £60.00 + VAT
Nominal Ledger £60.00 + VAT

Produces trial balance and up to twenty reports in addition to Profit and Loss and Balance sheet. This programme can be used on its own and it can read files set up by our Purchase and Sales control.

Write or phone for further details

ELECTRONIC AIDS (TEWKESBURY) LTD

Mythe Crest, The Mythe, Tewkesbury
Gloucestershire GL20 6EB
Tel: 0386 831020/0684 294003

PET CONVERSIONS & UPGRADES

It's here at a **NEW** low low price!! Don't throw out your old 9" PET. The **MICROPORT 80** column conversion board for the 9" PET/CBM BASIC 4.0, or upgraded 2001/3000 series machines, will upgrade it to a true 8000 series. Simply plugs into the main logic board and with a small keyboard modification turns your PET into an 8032. Compatible with 8032 software and add-on ROM utilities. Supplied complete with full fitting instructions, or fitted free of charge if brought to our workshops.

Full money back guarantee within 14 days if not delighted.	£125.00
Externally mounted switching unit for above (40/80 column switchable)	£15.00
12" VDU (FAT40) 80 column conversion	£82.00
40 to 80 column switchable (two machines in one!)	£98.00
Full keyboard functions:– i.e. TAB, ESC, REPEAT, SCROLL up/down, define WINDOW, lower case, graphics mode & DELETE from/to cursor. All available in direct or program mode. Any MICROPORT converted machine is also upgradable to 8096 specification with our 64K add-on board.	£250.00

CBM 64 QUALITY SOFTWARE

If you own a PET system with disks or printer and have added a COMMODORE 64 then why not use your PET as an interface for the 64?
SIPOD is a serial IEEE to parallel IEEE software interface allowing you to use all the PETs disk drives, printers, plotters, modems etc. directly from the 64. No memory space is consumed within the 64 as **SIPOD** loads and executes within the PET. **SIPOD** is supplied complete with interface lead and instructions. £29.00

PRINTLINK 64. Interfaces a 64 directly to any printer with a Centronics input. The printer will respond to all the normal Basic commands for device #4. Supplied complete with instructions and interface cable. £26.00

We only sell one word processor for the 64. We think it is the best!

VIZAWRITE 64. Text formatting word processor. Disk or cartridge	£69.00
VIZASPELL 64. Spelling checker with 30,000 word dictionary	£59.00
VIZAWRITE + VIZASPELL. Combined package. (Disk only)	£99.00

MIKRO ASSEMBLER. Write machine code with the ease of BASIC	£50.00
ARROW. Save & load to tape up to 7 times faster than normal	£39.00
VICTREE. All Toolkit & BASIC 4.0 commands plus a lot more	£49.00
ZOOM. An excellent machine code monitor for the 64	£10.00
GRAPHIX 64. Easy to use Hi-Resolution graphics from BASIC	£10.00
STIX. A most addictive and compelling game (joystick required)	£17.35

Official orders from schools, universities, major companies etc. are welcome. U.K. customers please add 15% VAT. Prepaid orders are POST FREE.

Telephone Mick Bignell for details of any of the above at:–

MICROPORT 7 Clydesdale Close, Borehamwood, Herts. WD6 2SD. Tel: 01-953 8385

HINTS AND TIPS

```
5 GOSUB11000
10 POKE53280,2:POKE56334,PEEK(56334)AND254
20 SYS49152:POKE49206,1
30 I=50:GOSUB100
40 A=PEEK(56320)
50 IF((AAND2)=0)ANDI<210THENI=I+2
60 IF((AAND1)=0)ANDI>50THENI=I-2
70 GOSUB100
80 IF(AAND16)=0THENPOKE56334,PEEK(56334)OR1:END
90 GOTO40
100 POKE49232,I:POKE49211,40+I:RETURN
10000 DATA120,169,34,141,20,3,169
10010 DATA192,141,21,3,173,17,208
10020 DATA41,127,141,17,208,169,151
10030 DATA141,18,208,173,26,208,9
10040 DATA1,141,26,208,88,96,169
10050 DATA1,44,25,208,208,3,76
10060 DATA49,234,173,33,208,41,15
10070 DATA201,2,208,21,169,1,141
10080 DATA33,208,169,90,141,18,208
10090 DATA169,1,141,25,208,104,168
10100 DATA104,170,104,64,169,2,141
10110 DATA33,208,169,50,141,18,208
10120 DATA76,63,192,-1
11000 I=49152
11010 READA:IFA=-1THEN11050
11020 POKEI,A:I=I+1
11030 T=T+A
11040 GOTO11010
11050 IF T<>9433 THEN PRINT"■DATA ERROR:"T,T:END
11060 IF I<>49239 THEN PRINT"■NUMBER OF DATA ERROR":END
11070 RETURN
READY.
```

Raster Interrupts.

A very useful part of the 64's VIC chip is the way that interrupts can be caused by the raster register. This can be very useful for producing 'Split Screens' as in The Hobbit.

The raster scans down the television screen and puts onto the screen the information sent to it by the computer. There are two registers that affect the raster. These are locations $D012 (53266) which is the low byte of the raster position, and $D011 (53265) which holds in its highest bit the high bit of the raster position. These locations can be read to get the current raster position.

The raster value goes between 0 and 320 (it is very hard to find the maximum value) but the only values that are actually on the screen are between 51 and 251 not including the border. This means that for most purposes the highest bit is never needed.

There is a use, however, for the highest bit: A lot of games boast the fact that they have flicker free sprites and graphics. The high bit can be WAITed for in Basic to produce flicker free displays. The method of doing so is to use the line following:

```
WAIT53265,128:WAIT53265,128,128
```

This first waits for the high bit to become 1 and then for the high bit to become zero. Just waiting for it to become 1 will not work and the wait will be about halfway down the first line on the screen. A short program to test the usefulness of the screen wait is as follows. If you want to see how it would look without the wait, insert REM at the beginning of line 20.

```
10 FORI=0TO15
20 WAIT53265,128:WAIT53265,128,128
30 POKE53281,I
40 NEXT
50 GOTO10
```

This program just changes the screen colour using the screen wait.

This is fine when you just wish to intercept the raster at the top of the screen but in some cases, it could be useful to stop it at other places on the screen. This is where the raster interrupt comes into being. The two registers mentioned earlier have a second purpose, that of setting a raster compare value. When this value has been set and bit 0 of location $D01A (53274) has been set to a 1, each time the raster value is the same as the raster compare value, an interrupt is forced and if you have a routine 'wedged' into interrupts to carry out this interrupt, it can be used. The way to test if it is a normal interrupt or a raster

COMMODORE 64
Fast and Powerful
Assembler/Disassembler

Lets you program using 6510/6502 mnemonics as easily as if it were Basic. Just enter the line number followed by the statement.

LABELS allowed with all branch and jump instructions.
VARIABLES let you refer to data or memory locations by a name.
COMMENTS are allowed anywhere.
All function keys defined to execute commands.

SIX POWERFUL PSEUDO OPS
ASCII BASE BIT BYTE END WORD

SIX CONTROL COMMANDS
LOAD SAVE DISPLAY STOP ERASE CONVERT

Disassembler will dis-assemble any area of memory

TAPE AND MANUAL	**ONLY £9.99** Overseas £13.99
VIC 20 ASSEMBLER (MIN 16K) Labels variables and pseudo ops	**£9.99**
A manual containing descriptions and addresses of all the Basic Interpreters and Operating systems 450 routines	**£4.99**

SAE for details
MICRO POWER
BCM 8713
LONDON WC1N 3XX

BREAK AWAY FROM BASIC!

6502/6510 EDITOR-ASSEMBLER
for the serious user of the
VIC-20 and C-64

At last – a really professional software package written in machine code, for writing and running your own ASSEMBLER language programs/subroutines.

FREDITOR lets you write the assembler language program ("source") or any other text you want to process. The screen automatically scrolls across a 255 character width, and up and down any length of file . . . Beautiful to use, with FIND/REPLACE feature, Tabs, Disk Management Commands, upper and lower case. MOVE blocks of text around . . .

OSIRISAN is then used to Assemble your "source" producing a "listing" output which can be printed out or stored, whilst the machine code can go into memory ready for running or can be stored. Use symbols, labels, expressions and comments in the source text. OSIRISAN generates a SYMBOL TABLE. You can CHAIN files together. If you Assemble from disk onto disk you can handle files of any length regardless of the memory size of the computer.

Both FREDITOR & OSIRISAN can print out onto 1515 or 1525 printers, or to a FAST printer by using the PARALLEL PORT. Connection data and all other information appears in a comprehensive MANUAL.

Prices: 1541-DISK	**£22.95 State**
Cassette	**£19.95 machine**

ELMHIRST ENTERPRISES 0452 64938
99 Porchester Road, Hucclecote, GLOUCESTER GL3 3DY

```
0000 1200      OSIRIS=$FF   ;It's the Greatest
0001 1200 A9FF LDA #OSIRIS  ;Buy immediately!
```

64-STATSPOWER
STATISTICS PACKAGE

Now available for the Commodore 64, a most sophisticated statistical package. With the aid of 64-STATSPOWER you can become a statistics expert in a matter of hours. Ideal for forecasting, business, home use, schools, students, research workers, hobbyists, marketing, sales, administration, scientists.

The possible uses of 64-STATSPOWER are limited only by your own imagination. Comprehensive manual (with numerous worked examples) guides the novice user through the use of the various sttistical techniques – invaluable to students of statistics. In addition, the programs themselves are extremely user-friendly.

64-STATSPOWER has numerous advanced features not to be found on other much more expensive statistical packages. Contents include: ascending data sort; means (arithmetic, geometric, harmonic, quadratic); median; quartiles; semi IQ range; variance; S.D.; mean (absolute) deviation; max and min values; range; measures of skewness & kurtosis; deseasonalisation of data (weekly, monthly, quarterly); log-reciprocal time trend estimation; moving averages (user-defined length); linear and constant-growth rate time trend estimation; chi-square test (one-way classification & contingency tables); sophisticated multiple regression program (options include: dummy variables; user-specified data transformations; user-defined artificial variables; data alteration); regression coefficients; standard errors; R^2; Durbin-Watson; von-Neumann (with calculated asy. mean & variance); F-statistic.

Only **£14.95** (including p&p)
Available on cassette or disc (£2 extra). Cheques & P.O.'s to:

SCIENTIFIC SOFTWARE
BALGLASS HOUSE, 39 MAIN STREET,
HOWTH, CO. DUBLIN, EIRE.
Phone 326703. Trade enquiries welcome.

Superbase 64

TRANSFORMS THE COMMODORE 64 INTO A FULL-FEATURED AND PROFESSIONAL DATABASE SYSTEM! WITH UP TO 1000 CHARACTERS PER RECORD ON UP TO 4 SCREENS... AND UP TO 128 ITEMS PER RECORD, DEFINABLE AS KEY, TEXT, NUMERIC, CONSTANT, RESULT OR DATE... IN FILES OF UP TO 16M CHARACTERS! SUPERBASE 64 EVEN HAS SPREADSHEET AND CALCULATOR CAPABILITY, CALENDAR FUNCTIONS, EASY INPUT FROM WORDPROCESSOR/DATA FILES, BOTH MENU-DRIVEN AND PROGRAM OPTIONS, SORTING/SEARCHING, FULLY DEFINABLE OUTPUTS... SUPERBASE 64 IS ESSENTIAL IF YOU WANT THE MOST FROM YOUR 64! SUPPLIED ON CBM 1541 DISK WITH EXCELLENT TUTORIAL/REFERENCE MANUAL. OUR PRICE ~~£99.95~~ £88.00!

VIZAWRITE 64

VIZAWRITE 64 IS A HIGH-PERFORMANCE, LOW-COST WORD PROCESSOR, WITH ON-SCREEN FORMATTING, THAT TAKES FULL ADVANTAGE OF THE 64'S COLOUR, GRAPHICS AND MEMORY FEATURES... AND SUPPORTS VIRTUALLY ANY PRINTER! WITH A COMPREHENSIVE AND EASY-TO-FOLLOW USER MANUAL, VIZAWRITE IS THE ULTIMATE PERSONAL COMPUTER WORD PROCESSOR! AVAILABLE ON CARTRIDGE (~~£89.95~~ £75!), DISK (~~£79.95~~ £68!) OR WITH VIZASPELL (~~£99.95~~ £85!)

Master 64

MASTER 64 IS A TOTALLY NEW CONCEPT... A COMPLETE PROGRAM DEVELOPMENT PACKAGE, THAT'S AVAILABLE NOW FOR THE CBM 64. MASTER HAS 85 NEW COMMANDS... AND BASIC IV TOO! PLUS PROGRAMMER'S TOOLKIT, MACHINE CODE MONITOR, BUSINESS BASIC, KEYED DISK ACCESS, MULTIPLE SCREENS, USER-DEFINABLE INPUT ZONES, REPORT GENERATOR, 22-PLACE ARITHMETIC, DISK DATA COMPRESSION, DATE CONTROL, SCREEN PLOT, SCREEN DUMP, AND MORE... EVERYTHING YOU NEED TO PROGRAM YOUR 64 TO TOP PROFESSIONAL STANDARDS! (~~£143.75~~ £115!)

MORE SOFTWARE FOR COMMODORE 64:

PRACTICALC (DISK/TAPE) ...	[illegible]	£41.50
VIZASPELL (DISK)	[illegible]	£49.95
DTL COMPILER (DISK)	[illegible]	£109.00
DTL COMPILER (TAPE)	[illegible]	£36.95
TOOL 64 (CARTRIDGE)	[illegible]	£46.95

SOFTWARE FOR COMMODORE PET/700:

SUPERBASE (700/8096)	[illegible]	£425.00
SUPERSCRIPT (700)	[illegible]	£425.00
SUPERSCRIPT (8096)	[illegible]	£375.00
SUPERSCRIPT (3000-8000) ..	[illegible]	£225.00
MASTER (4000/8000/8096) ..	[illegible]	£225.00

PRICES SHOWN ABOVE INCLUDE 15% VAT, AND ARE CORRECT AT TIME OF GOING TO PRESS. PLEASE ORDER BY POST OR TELEPHONE, USING CHEQUE, ACCESS, BARCLAY CARD OR OFFICIAL ORDER. DESPATCH IS BY SAME-DAY 1ST CLASS POST, AND FREE (EXCEPT FOR OVERSEAS AND CREDIT ORDERS). FULL PRODUCT INFORMATION IS AVAILABLE ON REQUEST. [REF A27]

Calco Software

LAKESIDE HOUSE, KINGSTON HILL, SURREY, KT2 7QT. TEL 01-546-7256 one is done at SPLIT1 in the disassembly following. If it was not caused by the raster, a jump to the normal interrupts is done, but if it was caused by the raster, then our own routine is carried out.

When the change has been done, a 1 is written to the VIC interrupt register and return to normal operation.

In the routine, there are two parts depending on the present screen colour, one changes the colour of the background at the top of the screen and the other changes the colour at the halfway point on the screen. This is the easiest form of split screen use where the screen background colour is actually two colours, red at the top and purple at the bottom. This could easily be changed to, say, two different text screens, a text screen and a hi-res etc.

One last point to mention about the split screen routine is that with the standard keyboard scanning routine still working, the split is slightly untidy especially when a key is pressed.

The basic program included has the data for the machine code routine and a little program that allows you to change the top and bottom coordinates of the raster compare using the joystick. When running, the keyboard has been switched off so that the lines are neat and to exit the program, press stop restore or the fire button on the joystick. Experiment with the directions on the joystick for moving the split.

```
1000 *=$C000 ! START ADDRESS OF CODE
1010                SEI                             ! DISABLE IRQ
1020                LDA #<SPLIT1                    ! NEW IRQ LO
1030                STA $0314
1040                LDA #>SPLIT1                    ! NEW IRQ HI
1050                STA $0315
1060                LDA $D011                       ! RASTER SCAN HI BIT
1070                AND #$7F
1080                STA $D011
1090                LDA #$97
1100                STA $D012                       ! RASTER SCAN LO BYTE
1105                LDA $D01A
1110                ORA #$01
1140                STA $D01A                       ! ENABLE RASTER IRQ
1150                CLI                             ! ENABLE IRQ
1160                RTS
1170 SPLIT1         LDA #$01                        ! TEST IF RASTER
1180                BIT $D019                       !IRQ HAS OCCURED
1190                BNE CHANGE                      ! IF NOT, JUMP
1200                JMP $EA31                       !TO NORMAL IRQ
1210 CHANGE         LDA $D021                       ! CHECK IF SCREEN
1211                AND #$0F                        !COLOUR IS RED
1212                CMP #$02
1213                BNE CHANGE1                     ! NO.
1219                LDA #$04                        ! CHANGE SCREEN
1220                STA $D021                       !COLOUR TO PURPLE
1230                LDA #$00                        ! SET RASTER COMPARISON
1235                STA $D012                       !TO TOP OF SCREEN
1240 EXIT           LDA #$01                        ! TELL COMPUTER THAT
1250                STA $D019                       !RASTER IRQ HAS BEEN DONE
1300                PLA                             ! FULL REGISTERS AND RETURN
1301                TAY                             !FROM INTERRUPTS
1302                PLA
1303                TAX
1304                PLA
1310                RTI
1380 CHANGE1        LDA #$02                        ! SCREEN IS PURPLE CHANGE
1390                STA $D021                       !TO RED
1400                LDA #$97                        ! SET RASTER COMPARE TO
1410                STA $D012                       !HALFWAY DOWN SCREEN
1420                JMP EXIT                        ! EXIT IRQ
```

HINTS AND TIPS

This program shows how the sync and ring-mod bits in the SID chip control registers can be used to produce interesting sound effects. They are both done by setting a single tone into voice 3 and scanning up and down the scale for voice 1 with the ring-mod or sync set for voices 1 and 3.

```
10 S=54272
20 GOSUB63000
30 PRINT"♥PRESS KEY FOR REQUIRED SOUND:"
40 PRINT"◙◙◙◙◙▶▶▶▶1: TARDIS (DEMO OF RING MOD)"
50 PRINT"◙◙◙◙▶▶▶▶2: DEMO OF SYNC"
65 PRINT"◙◙◙◙◙◙◙◙◙◙◙▶▶▶▶HIT ANY KEY TO CHOOSE ANOTHER"
70 GETA$:IFVAL(A$)<1ORVAL(A$)>2THEN70
90 ONVAL(A$)GOTO1000,2000
1000 POKES+24,15:POKES+5,0:POKES+6,240
1010 POKES+4,21
1020 POKES+15,19:POKES+14,136
1030 FORK=0TO65535STEP1500:GOSUB4000:NEXT
1040 FORK=65535TO0STEP-1500:GOSUB4000:NEXT
1050 GOTO1030
2000 POKES+24,15:POKES+5,0:POKES+6,240
2010 POKES+4,35
2020 POKES+15,19:POKES+14,136
2030 FORK=0TO65535STEP600:GOSUB4000:NEXT
2040 FORK=65535TO0STEP-600:GOSUB4000:NEXT
2050 GOTO2030
4000 POKES+1,INT(K/256):POKES,K-INT(K/256)*256
4010 GETA$:IFA$<>""THENRUN
4020 RETURN
63000 FORI=0TO24
63010 POKES+I,0:NEXT:RETURN
READY.
```

NEW ORIGINAL GAMES
FOR THE COMMODORE 64

- **NIGHTMARE PARK** is in fact a compendium of 14 games. The task of the user is to gain as many points as possible travelling through a maze beset by obstacles at every turn. These infuriating obstacles are overcome by a combination of skill, sharp reflexes or by sheer good luck making Nightmare Park a suitable game for all ages. **PRICE £7.99**
- **DOTS & BOXES** is an intelligent game where the user and the computer take turns in completing boxes by drawing a line between two dots. The aim of the game is to win the most boxes whilst skilfully minimising the number of boxes given away to the computer. **PRICE £6.95**
- **CHOPPER LAND** Your chopper is chartered to transfer goods from your base and land SAFELY. An exciting new game full of surprises. **£7.99**

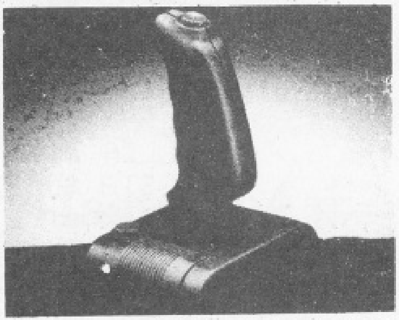
1 VOUCHER

- **HEXAPAWN** For strategic and persistent play. The opponent (computer) has no initial strategy but is programmed to learn from the user's wins to improve its own strategy. **£5.95**

Order any of these games and send 2 vouchers to receive your free copy of Hexopawn.

SEND CHEQUES/PO: A.R. SOFTWARE
86, Avonbrae Crescent Hamilton Scotland
Tel: 0698 282036
DEALER ENQUIRIES WELCOME

SPECTRAVIDEO™
GAME FREAKS
IF YOU WANT JOY . . . STICK TO US



We can supply Joysticks for most leading micros including Atari, Commodore, BBC, Spectravideo and Dragon

For further details
phone 01-203 6366/7
and ask for David Bishop or Kevin Pickering

VULCAN ELECTRONICS LTD
The UK's leading Joystick Distributor

Speedier utilities

This month we have a program to display track and sector on disk. The slow routines have been written in Machine Code to speed up the process.

The utility disk supplied with Commodore disk units contains a program that displays, in hexadecimal form, the contents of specified sectors on disk. Unfortunately, as the program is written entirely in Basic, you feel you have enough time to eat a three-course meal in the time it takes to display a full screenful of information! The parts that take up all of this time are the read from disk and conversion of decimal numbers, held in an array, to hex and ASCII characters.

By rewriting these slower sections in machine code, I have produced a version that can display to the screen almost instantly and output to a printer as fast as the print head can print. There are two main parts to the machine code; the first reads the specified block into memory just above Basic, and the second (this has two entry points, one for the first 128 bytes displayed and the other for the second 128) displays it to either the screen or printer.

As the program needs 256 bytes of memory that is safe from Basic (for the block), the End of Basic pointer has been lowered so that only around 6K is available to Basic. I have set it this low to maintain compatibility between 8, 16 and 32K machines – so you will have to reset the computer after you have finished using the program (or alter locations 52/3 back to their original values).

Both Basic 2.0 and Basic 4.0 are catered for without changes (a check is made at lines 210-240), and disk units 3040, 4040 and 2031 can be used. A small change to line 470 should allow the use of the 8050 and 8250 drives. (I say 'should' as I have no way of testing this out!) Alter T>35 to T>77 for the 8050 and to T>154 for the 8250.

This change should allow access to the extra tracks that are available on these units. There is no check in the program for the amount of sectors the user enters as these vary between the different machines; any errors will be taken care of by the disk operating system which will halt the program with error 66 (ILLEGAL TRACK OR SECTOR).

If you are using a 2031 single drive then enter 'S' when prompted for the drive number as this will tell the program to set up the address for the disk buffer in the correct place for this unit – all dual drives use address $1100 while the 2031 (and the 1541) uses $0300.

To exit the program type 'x' (+ return) when asked to enter the next track number. Typing 'x' in response to 'SECTOR' will take you back one step to 'TRACK'. Also, the space bar may be used instead of 'Y' (for 'yes') when asked if you want to continue to the next track and sector displayed. The 'bomb proof input' subroutine at line 810 prevents dropping back to Basic on the PET/CBM (or accidently continuing, without having entered anything, to the next statement on the CBM-64).

The program has been liberally sprinkled with REMs to help users understand how it works. The "I" part in line 400 is only really needed for the older 3040 drive as all the later ones automatically initialise themselves as soon as a disk is inserted; but don't miss out the OPEN15,8,15 as it is needed for all drives.

The second listing shows the modifications needed to enable the program to run on the CBM-64. The changes are mainly the removal of drive number references, not needed for the single drive 1541; and the relocation of the machine code section. The PET/CBM version has the machine code in the first cassette buffer while the 64 version has it above Basic.

Also an extra routine is added to make up for the lack of a hexadecimal number output routine; this is part of the m/c monitor in the PET/CBM and totally missing in the 64. This version should also run on the Vic providing it has got the full 29K expansion, but the screen display will be rather ragged due to its 22 columns.

M/C DISPLAY T & S

```
100 REM ** DISPLAY T & S (MACHINE CODE VERSION)   -   D. VINER  -  JAN 1984 **
110 REM ** FOR USE ON BASIC 2/4 PET/CBM (8-32K)  PLUS 3040/4040/2031 DRIVES **
120 :
130 REM * ADJUST MEMORY POINTER *
140 POKE52,0:POKE53,30:POKE59468,12:PRINTCHR$(142):CLR
150 :
160 REM * SET UP MACHINE CODE *
170 A=640
180 READB:IFB=999THEN220
190 POKEA,B:A=A+1:GOTO180
200 :
210 REM * CHECK FOR BASIC 2 OR 4 *
220 IFPEEK(65534)=27ANDPEEK(65535)=230THENPOKE767,117:POKE768,231:GOTO270
230 IFPEEK(65534)=66ANDPEEK(65535)=228THENPOKE767,34:POKE768,215:GOTO270
240 PRINT"[illegible] ROM TYPE NOT RECOGNISED ":STOP
250 :
260 REM * SCREEN DISPLAY *
```

```
270 PRINT"▙▚▚▮▮▮▮▮______________________________"
280 PRINT"        ▚ DISPLAY TRACK & SECTOR ▚▚"
290 V=17:REM * SET START OF DISK BUFFER (GETS CHANGED TO 3 FOR 2031) *
300 PRINT"▚▚DRIVE : 0▮";:GOSUB810:D$=LEFT$(X$,1)
310 IFD$="S"THENV=3:D$="0":GOTO330:REM * ENTER 'S' FOR 2031 *
320 IFD$<>"0"ANDD$<>"1"THEN270
330 PRINT"▚▚DISPLAY ON ▚S▮CREEN OR ▚P▮RINTER"
340 GETJ$:IFJ$=""THEN340
350 IFJ$="S"THENOPEN4,3:GOTO400
360 IFJ$="P"THENOPEN4,4:GOTO400
370 GOTO340
380 :
390 REM * OPEN FILES TO DISK *
400 OPEN15,8,15,"I"+D$:GOSUB770:REM * INITIALISE (ONLY NEEDED ON 3040) *
410 OPEN2,8,2,"#"+"0":GOSUB770:REM * RESERVE DISK BUFFER 0 *
420 :
430 REM * GET TRACK & SECTOR *
440 POKE158,0:PRINT"▚TRACK : ";:GOSUB810:T=VAL(X$)
450 :
460 REM * IF 'X' OR NON-VALID TRACK NO. IS ENTERED THEN PROGRAM EXITS *
470 IFT=0ORT>35ORX$="X"THENPRINT#15,"I"D$:CLOSE2:CLOSE4:CLOSE15:PRINT"▙":END
480 PRINT,,"▙SECTOR : ";:GOSUB810:IFX$="X"THEN440
490 S=VAL(X$)
500 IFJ$="S"THENPRINT"TRACK"T"SECTOR"S"▚"
510 IFJ$="P"THENPRINT#4,"TRACK"T"SECTOR"S
520 :
530 REM * GET BLOCK INTO MEMORY *
540 PRINT#15,"U1:2,"D$;T;S:GOSUB770:REM * READ BLOCK FROM DISK TO BUFFER *
550 PRINT#15,"B-P:2,1":REM * SET BUFFER POINTER *
560 PRINT#15,"M-R"CHR$(0)CHR$(V)
570 GET#15,A$:A$=A$+CHR$(0):REM * GET 1ST BYTE OF BLOCK *
580 POKE7936,ASC(A$):SYS640:REM * READ REST OF BLOCK INTO MEMORY *
590 :
600 REM * DISPLAY BLOCK ON SCREEN OR PRINTER *
610 CMD4:SYS659:REM * DISPLAY FIRST HALF OF BLOCK *
620 IFJ$="P"THEN640
630 GETZ$:IFZ$=""THEN630:REM * AWAIT KEYPRESS IF DISPLAYING TO SCREEN *
640 SYS667:PRINT#4:REM * DISPLAY REST OF BLOCK *
650 :
660 REM * GET NEXT TRACK & SECTOR *
670 T1=PEEK(7936):S1=PEEK(7937)
680 IFT1=0THENPRINT"▚▚END OF FILE":GOTO440
690 PRINT"▚NEXT TRACK, SECTOR : ";T1;S1
700 PRINT"DO YOU WANT THE NEXT TRACK AND SECTOR?"
710 GETZ$:IFZ$=""THEN710
720 IFZ$="Y"ORZ$=" "THENT=T1:S=S1:GOTO500
730 IFZ$="N"THEN440
740 GOTO710
750 :
760 REM * CHECK DISK ERROR CHANNEL *
770 INPUT#15,EN,EM$,ET,ES:IFEN=0THENRETURN
780 PRINT"▚DISK ERROR▮"EN,EM$,ET,ES:CLOSE2:CLOSE4:CLOSE15:END
790 :
800 REM * BOMB PROOF INPUT ROUTINE *
810 OPEN9,0:INPUT#9,X$:CLOSE9:PRINT:RETURN
820 :
830 REM * MACHINE CODE DATA *
840 DATA162,2,32,198,255,160,1,32,207,255,153,0,31,200,208,247
850 DATA76,204,255,169,31,133,2,169,0,133,1,165,1,32,254,2
860 DATA169,32,32,210,255,169,58,32,210,255,169,32,32,210,255,160
870 DATA0,177,1,32,254,2,169,32,32,210,255,200,192,8,208,241
880 DATA160,0,169,58,32,210,255,169,32,32,210,255,177,1,201,32
890 DATA144,12,201,96,144,10,201,160,144,4,201,224,144,2,169,32
900 DATA32,210,255,200,192,8,208,228,169,13,32,210,255,24,165,1
910 DATA105,8,133,1,201,0,208,1,96,201,128,208,158,96,76,999
READY.
```

```
FOR THE COMMODORE-64 REMOVE LINES 210-240 AND 290-320

AND REPLACE ALL THE FOLLOWING :-

110 REM ** FOR USE ON CBM-64  &  1541 DISK DRIVE                           **
140 POKE55,0:POKE56,112:PRINTCHR$(142):CLR
170 A=28672
180 READB:IFB=999THEN270
400 OPEN15,8,15:GOSUB770:REM * OPEN ERROR CHANNEL *
440 POKE198,0:PRINT"▩TRACK : ";:GOSUB810:T=VAL(X$)
470 IFT=0ORT>35ORX$="X"THENCLOSE2:CLOSE4:CLOSE15:PRINT"⊔":END
540 PRINT#15,"U1:2,";0;T;S:GOSUB770:REM * READ BLOCK FROM DISK TO BUFFER *
560 PRINT#15,"M-R"CHR$(0)CHR$(3)
580 POKE30720,ASC(A$):SYS28672:REM * READ REST OF BLOCK INTO MEMORY *
610 CMD4:SYS28691:REM * DISPLAY FIRST HALF OF BLOCK *
640 SYS28699:PRINT#4:REM * DISPLAY REST OF BLOCK *
670 T1=PEEK(30720):S1=PEEK(30721)
830 REM * MACHINE CODE DATA *
840 DATA162,2,32,198,255,160,1,32,207,255,153,0,120,200,208,247
850 DATA76,204,255,169,120,133,181,169,0,133,180,165,180,32,126,112
860 DATA169,32,32,210,255,169,58,32,210,255,169,32,32,210,255,160
870 DATA0,177,180,32,126,112,169,32,32,210,255,200,192,8,208,241
880 DATA160,0,169,58,32,210,255,169,32,32,210,255,177,180,201,32
890 DATA144,12,201,96,144,10,201,160,144,4,201,224,144,2,169,32
900 DATA32,210,255,200,192,8,208,228,169,13,32,210,255,24,165,180
910 DATA105,8,133,180,201,0,208,1,96,201,128,208,158,96,72,74
920 DATA74,74,74,32,150,112,170,104,41,15,32,150,112,72,138,32
930 DATA210,255,104,76,210,255,24,105,246,144,2,105,6,105,58,96,999
READY.
```

INDEPENDENT COMMODORE PRODUCTS USER GROUP

An Independent User Group for all Commodore owners.
** Public domain libraries and programs*
** Newsletter 6 times a year*
** Opposite is a short list of some of our Regional Groups. For information about your nearest Group please write to address below*
** Local and regional groups and meetings*

CAN YOU AFFORD NOT TO JOIN???

Annual Subscription for membership in UK is only – £10.00

Details from: **ICPUG Membership Secretary – Jack Cohen,**
30 Brancaster Road, Newbury Park,
Ilford, ESSEX IG2 7EP. TEL: 01-597 1229

RG095 – South East, Wing CDR Mick Ryan, 164 Chesterfield Drive, Riverhead, Sevenoaks, Kent (0732) 453530. Meet 3rd & 4th Thursday each month.
RG102 – Scotland. J. Smith, 19 Brewlands Road, Symington, Kilmarnock, Ayreshire (0563) 830407. Meet 1st & 3rd Thursday each month.
RG085 – Wales. F. Townsend, The Hill, Rhydowen, Llandyssul, Dyfed (05455) 5291.
RG111 – Merseyside. G. Jones, 41 Virginia Avenue, Lydiate, Merseyside (051) 526-4813. Meet alternate Wednesdays.
RG112 – West London. M. Franks. 196 Castellain Mansions, Castellain Road, London W9. (01) 286-0650 or (01) 839-7811.
24 Ashton Road, Wokingham, Berkshire RG11 1HR.

64 Memory Map

Due to popular demand we are publishing the memory map for the 64. This will come in two parts. The first part, which follows, is a description of the memory location below Basic programming memory. Next month we will publish the explanation of the ROM routines.

0000		0	Chip directional register
0001		1	Chip I/O; memory & tape control
0003	-0004	3–4	Float–Fixed vector
0005	-0006	5–6	Fixed–Float vector
0007		7	Search character
0008		8	Scan–quotes flag
0009		9	TAB column save
000A		10	0 = LOAD, 1 = VERIFY
000B		11	Input buffer pointer/# subscrpt
000C		12	Default DIM flag
000D		13	Type: FF = string, 00 = numeric
000E		14	Type: 80 = integer, 00 = floating point
000F		15	DATA scan/LIST quote/memry flag
0010		16	Subscript/FNx flag
0011		17	0 = INPUT;$40 = GET;$98 = READ
0012		18	ATN sign/Comparison eval flag
0013		19	Current I/O prompt flag
0014	-0015	20–21	Integer value
0016		22	Pointer: temporary string stack
0017	-0018	23–24	Last temp string vector
0019	-0021	25–33	Stack for temporary strings
0022	-0025	34–37	Utility pointer area
0026	-002A	38–42	Product area for multiplication
002B	-002C	43–44	Pointer: Start–of–Basic
002D	-002E	45–46	Pointer: Start–of–Variables
002F	-0030	47–48	Pointer: Start–of–Arrays
0031	-0032	49–50	Pointer: End–of–Arrays
0033	-0034	51–52	Pointer: String–storage(moving down)
0035	-0036	53–54	Utility string pointer
0037	-0038	55–56	Pointer: Limit–of–memory
0039	-003A	57–58	Current Basic line number
003B	-003C	59–60	Previous Basic line number
003D	-003E	61–62	Pointer: Basic statement for CONT
003F	-0040	63–64	Current DATA line number
0041	-0042	65–66	Current DATA address
0043	-0044	67–68	Input vector
0045	-0046	69–70	Current variable name
0047	-0048	71–72	Current variable address
0049	-004A	73–74	Variable pointer for FOR/NEXT
004B	-004C	75–76	Y–save; op–save; Basic pointer save
004D		77	Comparison symbol accumulator
004E	-0053	78–83	Misc work area, pointers, etc
0054	-0056	84–86	Jump vector for functions
0057	-0060	87–96	Misc numeric work area
0061		97	Accum#1: Exponent
0062	-0065	98–101	Accum#1: Mantissa
0066		102	Accum#1: Sign
0067		103	Series evaluation constant pointer
0068		104	Accum#1 hi–order (overflow)
0069	-006E	105–110	Accum#2: Exponent, etc.
006F		111	Sign comparison, Acc#1 vs #2
0070		112	Accum#1 lo–order (rounding)
0071	-0072	113–114	Cassette buff len/Series pointer
0073	-008A	115–138	CHRGET subroutine; get Basic char
007A	-007B	122–123	Basic pointer (within subrtn)
008B	-008F	139–143	RND seed value
0090		144	Status word ST
0091		145	Keyswitch PIA: STOP and RVS flags
0092		146	Timing constant for tape
0093		147	Load = 0, Verify = 1
0094		148	Serial output: deferred char flag
0095		149	Serial deferred character
0096		150	Tape EOT received
0097		151	Register save
0098		152	How many open files
0099		153	Input device, normally 0
009A		154	Output CMD device, normally 3
009B		155	Tape character parity
009C		156	Byte–received flag
009D		157	Direct = $80/RUN = 0 output control
009E		158	Tp Pass 1 error log/char buffer
009F		159	Tp Pass 2 err log corrected
00A0	-00A2	160–162	Jiffy Clock HML
00A3		163	Serial bit count/EOI flag
00A4		164	Cycle count
00A5		165	Countdown,tape write/bit count
00A6		166	Tape buffer pointer
00A7		167	Tp Wrt ldr count/Rd pass/inbit
00A8		168	Tp Wrt new byte/Rd error/inbit cnt
00A9		169	Wrt start bit/Rd bit err/stbit
00AA		170	Tp Scan;Cnt;Ld;End/byte assy
00AB		171	Wr lead length/Rd checksum/parity
00AC	-00AD	172–173	Pointer: tape bufr, scrolling
00AE	-00AF	174–175	Tape end adds/End of program
00B0	-00B1	176–177	Tape timing constants
00B2	-00B3	178–179	Pntr: start of tape buffer
00B4		180	1 = Tp timer enabled; bit count
00B5		181	Tp EOT/RS232 next bit to send
00B6		182	Read character error/outbyte buf
00B7		183	# characters in file name
00B8		184	Current logical file
00B9		185	Current secndy address
00BA		186	Current device
00BB	-00BC	187–188	Pointer to file name

00BD		189	Wr shift word/Rd input char	
00BE		190	# blocks remaining to Wr/Rd	
00BF		191	Serial word buffer	
00C0		192	Tape motor interlock	
00C1	-00C2	193-194	I/O start address	
00C3	-00C4	195-196	Kernel setup pointer	
00C5		197	Last key pressed	
00C6		198	# chars in keybd buffer	
00C7		199	Screen reverse flag	
00C8		200	End-of-line for input pointer	
00C9	-00CA	201-202	Input cursor log (row, column)	
00CB		203	Which key: 64 if no key	
00CC		204	0 = flash cursor	
00CD		205	Cursor timing countdown	
00CE		206	Character under cursor	
00CF		207	Cursor in blink phase	
00D0		208	Input from screen/from keyboard	
00D1	-00D2	209-210	Pointer to screen line	
00D3		211	Position of cursor on above line	
00D4		212	0 = direct cursor, else programmed	
00D5		213	Current screen line length	
00D6		214	Row where curosr lives	
00D7		215	Last inkey/checksum/buffer	
00D8		216	# of INSERTs outstanding	
00D9	-00F2	217-242	Screen line link table	
00F3	-00F4	243-244	Screen color pointer	
00F5	-00F6	245-246	Keyboard pointer	
00F7	-00F8	247-248	RS-232 Rcv pntr	
00F9	-00FA	249-250	RS-232 Tx pntr	
00FF	-010A	256-266	Floating to ASCII work area	
0100	-013E	256-318	Tape error log	
0100	-01FF	256-511	Processor stack area	
0200	-0258	512-600	Basic input buffer	
0259	-0262	601-610	Logical file table	
0263	-026C	611-620	Device # table	
026D	-0276	621-630	Sec Adds table	
0277	-0280	631-640	Keybd buffer	
0281	-0282	641-642	Start of Basic Memory	
0283	-0284	643-644	Top of Basic Memory	
0285		645	Serial bus timeout flag	
0286		646	Current color code	
0287		647	Color under cursor	
0288		648	Screen memory page	
0289		649	Max size of keybd buffer	
028A		650	Repeat all keys	
028B		651	Repeat speed counter	
028C		652	Repeat delay counter	
028D		653	Keyboard Shift/Control flag	
028E		654	Last shift pattern	
028F	-0290	655-656	Keyboard table setup pointer	
0291		657	Keyboard shift mode	
0292		658	0 = scroll enable	
0293		659	RS-232 control reg	
0294		660	RS-232 command reg	
0295	-0296	661-662	Bit timing	
0297		663	RS-232 status	
0298		664	# bits to send	
0299	-029A	665	RS-232 speed/code	
029B		667	RS232 receive pointer	
029C		668	RS232 input pointer	
029D		669	RS232 transmit pointer	
029E		670	RS232 output pointer	
029F	-02A0	671-672	IRQ save during tape I/O	
02A1		673	CIA 2 (NMI) Interrupt Control	
02A2		674	CIA 1 Timer A control log	
02A3		675	CIA 1 Interrupt Log	
02A4		676	CIA 1 Timer A enabled flag	
02A5		677	Screen row marker	
02C0	-02FE	704-766	(Sprite 11)	
0300	-0301	768-769	Error message link	
0302	-0303	770-771	Basic warm start link	
0304	-0305	772-773	Crunch Basic tokens link	
0306	-0307	774-775	Print tokens link	
0308	-0309	776-777	Start new Basic code link	
030A	-030B	778-779	Get arithmetic element link	
030C		780	SYS A-reg save	
030D		781	SYS X-reg save	
030E		782	SYS Y-reg save	
030F		783	SYS status reg save	
0310	-0312	784-785	USR function jump	(B248)
0314	-0315	788-789	Hardware interrupt vector	(EA31)
0316	-0317	790-791	Break interrupt vector	(FE66)
0318	-0319	792-793	NMI interrupt vector	(FE47)
031A	-031B	794-795	OPEN vector	(F34A)
031C	-031D	796-797	CLOSE vector	(F291)
031E	-031F	798-799	Set-input vector	(F20E)
0320	-0321	800-801	Set-output vector	(F250)
0322	-0323	802-803	Restore I/O vector	(F333)
0324	-0325	804-805	INPUT vector	(F157)
0326	-0327	806-807	Output vector	(F1CA)
0328	-0329	808-809	Test-STOP vector	(F6ED)
032A	-032B	810-811	GET vector	(F13E)
032C	-032D	812-813	Abort I/O vector	(F32F)
032E	-032F	814-815	Warm start vector	(FE66)
0330	-0331	816-817	LOAD link	(F4A5)
0332	-0333	818-819	SAVE link	(F5ED)
033C	-03FB	828-1019	Cassette buffer	
0340	-037E	832-894	(Sprite 13)	
0380	-03BE	896-958	(Sprite 14)	
03C0	-03FE	960-1022	(Sprite 15)	
0400	-07FF	1024-2047	Screen memory	
0800	-9FFF	2048-40959	Basic RAM memory	
8000	-9FFF	32768-40959	Alternate: ROM plug-in area	
A000	-BFFF	40960-49151	ROM: Basic	
A000	-BFFF	49060-59151	Alternate: RAM	
C000	-CFFF	49152-53247	RAM memory, including alternate	
D000	-D02E	53248-53294	Video Chip (6566)	
D400	-D41C	54272-54300	Sound Chip (6581 SID)	
D800	-DBFF	55296-56319	Color nybble memory	
DC00	-DC0F	56320-56335	Interface chip 1, IRQ (6526 CIA)	
DD00	-DD0F	56576-56591	Interface chip 2, NMI (6526 CIA)	
D000	-DFFF	53248-53294	Alternate: Character set	
E000	-FFFF	57344-65535	ROM: Operating System	
E000	-FFFF	57344-65535	Alternate: RAM	
FF81	-FFF5	65409-65525	Jump Table, Including:	
FFC6			– Set Input channel	
FFC9			– Set Output channel	
FFCC			– Restore default I/O channels	
FFCF			– INPUT	
FFD2			– PRINT	
FFE1			– Test Stop key	
FFE4			– GET	

64 Basic aids x 4

In the February issue of Commodore Computing International, we mentioned that we would be running a series of routines for the 64 that can be used as programming aids. There are four routines this month: Trace, Find, Disk, Catalog. None of these routines' addresses conflicts with each other or with those previously published. The disk and catalog routines assume that the disk unit is unit 8.

Trace:

This routine enables a Basic program line trace facility which prints the Basic line number being run at the current cursor position. Trace is enabled by SYS49409 and disabled by SYS49479.

```
10 I=49409:T=0
20 READA:IFA=-1THEN50
30 POKEI,A:I=I+1
40 T=T+A:GOTO20
50 IFT<>10002THENPRINT"▓▓CHECKSUM ERROR:"10002,T:
60 PRINT"▓▓USE SYS49409 TO ENABLE TRACE"
70 PRINT"▓▓USE SYS49479 TO DISABLE"
80 PRINT"▓▓":END
100 DATA120,169,14,141,8,3,169
110 DATA193,141,9,3,88,96,165
120 DATA157,240,3,76,228,167,165
130 DATA57,201,0,208,9,165,58
140 DATA201,0,208,3,76,228,167
150 DATA165,57,141,24,193,165,58
160 DATA141,30,193,169,91,32,210
170 DATA255,166,57,165,58,32,205
180 DATA189,169,93,32,210,255,169
190 DATA32,32,210,255,76,228,167
200 DATA120,169,228,141,8,3,169
210 DATA167 141,9,3,88,96,-1
```

```
C101  78      SEI
C102  A90E    LDA  #$0E
C104  8D0803  STA  $0308
C107  A9C1    LDA  #$C1
C109  8D0903  STA  $0309
C10C  58      CLI
C10D  60      RTS
C10E  A59D    LDA  $9D
C110  F003    BEQ  $C115
C112  4CE4A7  JMP  $A7E4
C115  A539    LDA  $39
C117  C900    CMP  #$00
C119  D009    BNE  $C124
C11B  A53A    LDA  $3A
C11D  C900    CMP  #$00
C11F  D003    BNE  $C124
C121  4CE4A7  JMP  $A7E4
C124  A539    LDA  $39
C126  8D18C1  STA  $C118
C129  A53A    LWH  $3A
C12B  8D1EC1  STA  $C11E
C12E  A95B    LDA  #$5B
C130  20D2FF  JSR  $FFD2
C133  A639    LDX  $39
C135  A53A    LDA  $3A
C137  20CDBD  JSR  $BDCD
C13A  A95D    LDA  #$5D
C13C  20D2FF  JSR  $FFD2
C13F  A920    LDA  #$20
C141  20D2FF  JSR  $FFD2
C144  4CE4A7  JMP  $A7E4
C147  78      SEI
C148  A9E4    LDA  #$E4
C14A  8D0803  STA  $0308
C14D  A9A7    LDA  #$A7
C14F  8D0903  STA  $0309
C152  58      CLI
C153  60      RTS
```

```
10 I=49772:T=0
20 READA:IFA=-1THEN50
30 POKEI,A:I=I+1
40 T=T+A:GOTO20
50 IFT<>22816THENPRINT"▓▓CHECKSUM ERROR:"22816,T:END
60 PRINT"▓▓USE SYS49772 TO READ DISK ERROR"
70 PRINT"▓▓USE SYS49772"CHR$(34)"XX"CHR$(34)" TO SEND DISK COMMAND"
80 PRINT"▓":END
100 DATA32,121,0,240,3,76,226
110 DATA194,169,0,133,183,32,176
120 DATA194,169,13,32,210,255,169
130 DATA18,32,210,255,162,15,32
140 DATA198,255,32,207,255,72,165
150 DATA144,208,7,104,32,210,255
160 DATA76,138,194,104,169,15,133
170 DATA73,32,204,225,169,146,32
180 DATA210,255,169,13,32,210,255
190 DATA169,0,76,198,255,32,201
200 DATA194,141,155,194,141,234,194
210 DATA141,134,194,133,184,169,15
220 DATA133,185,169,8,133,186,76
230 DATA193,225,169,15,166,152,224
240 DATA0,240,16,221,88,2,208
250 DATA6,56,233,1,76,203,194
260 DATA202,240,2,208,240,96,201
270 DATA34,240,3,76,8,175,169
280 DATA15,133,73,32,204,225,32
290 DATA115,0,165,122,133,187,165
300 DATA123,133,188,162,0,32,99
310 DATA194,240,11,201,34,240,7
320 DATA232,32,93,194,76,0,195
330 DATA134,183,32,176,194,169,13
340 DATA32,210,255,76,116,164,-1
```

Disk:

This routine is the major part of a dos (disk operating system) aid, it allows the user to send dos commands without the OPEN 1,8,15 on the beginning.

An example of this is:
SYS49772"I" will replace:
OPEN15,8,15,"I"

It is obvious that there is not a lot of saving of typing but when the complete Basic aid is published, the sys calls will be given Basic command names e.g. SYS49772 will be replaced with DISK.

The other use of this sys call is to return a disk error message. By just typing SYS49772 the disk error channel will be read and displayed in reverse on the screen. Again when the completed basic aid is published, just DISK.

```
C26C  207900   JSR  $0079
C26F  F003     BEQ  $C274
C271  4CE2C2   JMP  $C2E2
C274  A900     LDA  #$00
C276  85B7     STA  $B7
C278  20B0C2   JSR  $C2B0
C27B  A90D     LDA  #$0D
C27D  20D2FF   JSR  $FFD2
C280  A912     LDA  #$12
C282  20D2FF   JSR  $FFD2
C285  A20F     LDX  #$0F
C287  20C6FF   JSR  $FFC6
C28A  20CFFF   JSR  $FFCF
C28D  48       PHA
C28E  A590     LDA  $90
C290  D007     BNE  $C299
C292  68       PLA
C293  20D2FF   JSR  $FFD2
C296  4C8AC2   JMP  $C28A
C299  68       PLA
C29A  A90F     LDA  #$0F
C29C  8549     STA  $49
C29E  20CCE1   JSR  $E1CC
C2A1  A992     LDA  #$92
C2A3  20D2FF   JSR  $FFD2
C2A6  A90D     LDA  #$0D
C2A8  20D2FF   JSR  $FFD2
C2AB  A900     LDA  #$00
C2AD  4CC6FF   JMP  $FFC6
C2B0  20C9C2   JSR  $C2C9
C2B3  8D9BC2   STA  $C29B
C2B6  8DEAC2   STA  $C2EA
C2B9  8D86C2   STA  $C286
C2BC  85B8     STA  $B8
C2BE  A90F     LDA  #$0F
C2C0  85B9     STA  $B9
C2C2  A908     LDA  #$08
C2C4  85BA     STA  $BA
C2C6  4CC1E1   JMP  $E1C1
C2C9  A90F     LDA  #$0F
C2CB  A698     LDX  $98
C2CD  E000     CPX  #$00
```

```
42   C2CF  F010      BEQ  $C2E1       59  C2F3  A57A     LDA  $7A
43   C2D1  DD5802    CMP  $0258,X     60  C2F5  85BB     STA  $BB
44   C2D4  D006      BNE  $C2DC       61  C2F7  A57B     LDA  $7B
45   C2D6  38        SEC              62  C2F9  85BC     STA  $BC
46   C2D7  E901      SBC  #$01        63  C2FB  A200     LDX  #$00
47   C2D9  4CCBC2    JMP  $C2CB       64  C2FD  2063C2   JSR  $C263
48   C2DC  CA        DEX              65  C300  F00B     BEQ  $C30D
49   C2DD  F002      BEQ  $C2E1       66  C302  C922     CMP  #$22
50   C2DF  D0F0      BNE  $C2D1       67  C304  F007     BEQ  $C30D
51   C2E1  60        RTS              68  C306  E8       INX
52   C2E2  C922      CMP  #$22        69  C307  205DC2   JSR  $C25D
53   C2E4  F003      BEQ  $C2E9       70  C30A  4C00C3   JMP  $C300
54   C2E6  4C08AF    JMP  $AF08       71  C30D  86B7     STX  $B7
55   C2E9  A90F      LDA  #$0F        72  C30F  20B0C2   JSR  $C2B0
56   C2EB  8549      STA  $49         73  C312  A90D     LDA  #$0D
57   C2ED  20CCE1    JSR  $E1CC       74  C314  20D2FF   JSR  $FFD2
58   C2F0  207300    JSR  $0073       75  C317  4C74A4   JMP  $A474
```

```
10 I=49946:T=0
20 READA:IFA=-1THEN50
30 POKEI,A:I=I+1
40 T=T+A:GOTO20
50 IFT<>29730THENPRINT"QQCHECKSUM ERROR:"29730,T:END
60 PRINT"QQUSE SYS49946,0 FOR DIRECTORY LISTING"
70 PRINT" OF DRIVE 0 AND SYS49946,1 FOR DRIVE 1"
80 PRINT"QQ":END
100 DATA32,253,174,32,121,0,240
110 DATA11,201,48,240,7,201,49
120 DATA240,7,76,8,175,169,48
130 DATA208,2,169,49,141,235,195
140 DATA169,2,162,234,160,195,32
150 DATA189,255,169,14,32,203,194
160 DATA162,8,160,0,32,186,255
170 DATA32,192,255,144,10,72,165
180 DATA184,32,195,255,104,76,249
190 DATA224,160,3,132,183,166,184
200 DATA32,198,255,32,207,255,133
210 DATA87,32,183,255,208,114,32
220 DATA207,255,133,88,32,183,255
230 DATA208,104,164,183,136,208,224
240 DATA132,183,32,207,255,72,32
250 DATA183,255,170,104,224,0,208
260 DATA84,164,183,192,80,176,78
270 DATA153,0,2,170,240,4,230
280 DATA183,208,227,32,204,255,166
290 DATA159,224,3,240,5,166,158
300 DATA32,201,255,166,87,165,88
310 DATA32,205,189,169,32,32,210
320 DATA255,160,0,185,0,2,240
330 DATA6.32,210,255,200,208,245
340 DATA169,13,32,210,255,32,204
```

Catalog:

The last routine this month is a routine that displays the directory of a disk to the screen. The advantage of this routine over LOAD"$",8 is that the load loads the directory into memory and then you must list it. This routine will display the directory straight to the screen and not load over your program.

To display a directory, enter SYS49946,0 for drive 0 and all single disk owners and for the lucky ones who have double disk drives connected to their 64's, SYS49946,1 will display the directory on drive 1.

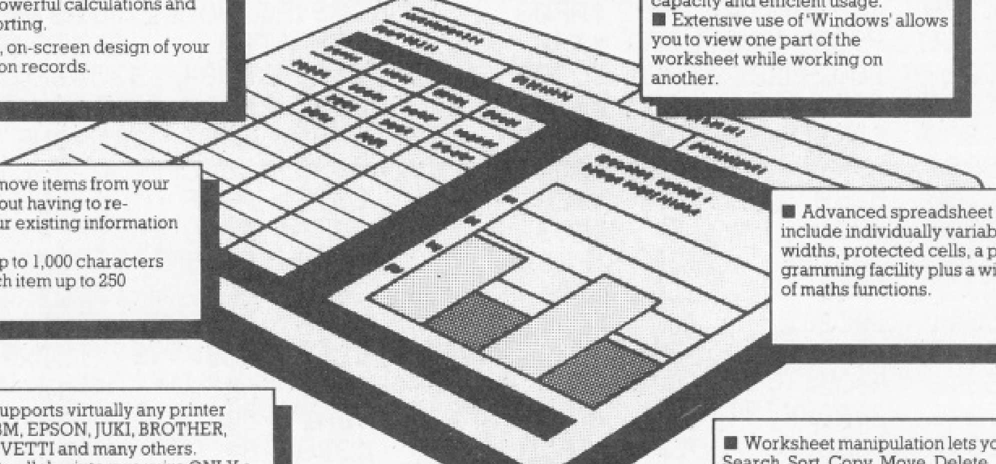
```
350 DATA255,32,225,255,240,16,32
360 DATA228,255,201,32,208,5,32
370 DATA228,255,240,251,160,2,208
380 DATA155,32,204,255,165,184,32
390 DATA195,255,76,123,227,36,48,-1
```

```
C31A  20FDAE   JSR  $AEFD
C31D  207900   JSR  $0079
C320  F00B     BEQ  $C32D
C322  C930     CMP  #$30
C324  F007     BEQ  $C32D
C326  C931     CMP  #$31
C328  F007     BEQ  $C331
C32A  4C08AF   JMP  $AF08
C32D  A930     LDA  #$30
C32F  D002     BNE  $C333
C331  A931     LDA  #$31
C333  8DEBC3   STA  $C3EB
C336  A902     LDA  #$02
C338  A2EA     LDX  #$EA
C33A  A0C3     LDY  #$C3
C33C  20BDFF   JSR  $FFBD
C33F  A90E     LDA  #$0E
C341  20CBC2   JSR  $C2CB
C344  A208     LDX  #$08
C346  A000     LDY  #$00
C348  20BAFF   JSR  $FFBA
C34B  20C0FF   JSR  $FFC0
C34E  900A     BCC  $C35A
C350  48       PHA
C351  A5B8     LDA  $B8
C353  20C3FF   JSR  $FFC3
C356  68       PLA
C357  4CF9E0   JMP  $E0F9
C35A  A003     LDY  #$03
C35C  84B7     STY  $B7
C35E  A6B8     LDX  $B8
C360  20C6FF   JSR  $FFC6
C363  20CFFF   JSR  $FFCF
C366  8557     STA  $57
C368  20B7FF   JSR  $FFB7
C36B  D072     BNE  $C3DF
C36D  20CFFF   JSR  $FFCF
C370  8558     STA  $58
C372  20B7FF   JSR  $FFB7
C375  D068     BNE  $C3DF
C377  A4B7     LDY  $B7
C379  88       DEY
C37A  D0E0     BNE  $C35C
C37C  84B7     STY  $B7
C37E  20CFFF   JSR  $FFCF
C381  48       PHA
C382  20B7FF   JSR  $FFB7
C385  AA       TAX
C386  68       PLA
C387  E000     CPX  #$00
C389  D054     BNE  $C3DF
C38B  A4B7     LDY  $B7
C38D  C050     CPY  #$50
C38F  B04E     BCS  $C3DF
C391  990002   STA  $0200,Y
C394  AA       TAX
C395  F004     BEQ  $C39B
C397  E6B7     INC  $B7
C399  D0E3     BNE  $C37E
C39B  20CCFF   JSR  $FFCC
C39E  A69F     LDX  $9F
C3A0  E003     CPX  #$03
C3A2  F005     BEQ  $C3A9
C3A4  A69E     LDX  $9E
C3A6  20C9FF   JSR  $FFC9
C3A9  A657     LDX  $57
C3AB  A558     LDA  $58
C3AD  20CDBD   JSR  $BDCD
C3B0  A920     LDA  #$20
C3B2  20D2FF   JSR  $FFD2
C3B5  A000     LDY  #$00
C3B7  B90002   LDA  $0200,Y
C3BA  F006     BEQ  $C3C2
C3BC  20D2FF   JSR  $FFD2
C3BF  C8       INY
C3C0  D0F5     BNE  $C3B7
C3C2  A90D     LDA  #$0D
C3C4  20D2FF   JSR  $FFD2
C3C7  20CCFF   JSR  $FFCC
C3CA  20E1FF   JSR  $FFE1
C3CD  F010     BEQ  $C3DF
C3CF  20E4FF   JSR  $FFE4
C3D2  C920     CMP  #$20
C3D4  D005     BNE  $C3DB
C3D6  20E4FF   JSR  $FFE4
C3D9  F0FB     BEQ  $C3D6
C3DB  A002     LDY  #$02
C3DD  D09B     BNE  $C37A
C3DF  20CCFF   JSR  $FFCC
C3E2  A5B8     LDA  $B8
C3E4  20C3FF   JSR  $FFC3
C3E7  4C7BE3   JMP  $E37B
C3EA  2430     BIT  $30
```

VIZASTAR 64

THE INFORMATION PROCESSOR

■ Spreadsheet ■ Database ■ Graphics



- ■ One word menu lines for easy selection of facilities.
- ■ The high resolution grid pattern frames the worksheet giving an easy-to read display.

- ■ Extract from your information files and include them into the worksheet for fast, powerful calculations and easy reporting.
- ■ Instant, on-screen design of your information records.

- ■ A 1000 Row by 64 Column wide worksheet with large memory capacity and efficient usage.
- ■ Extensive use of 'Windows' allows you to view one part of the worksheet while working on another.

- ■ Add or remove items from your records without having to re-construct your existing information records.
- ■ Records up to 1,000 characters long with each item up to 250 characters.

- ■ Advanced spreadsheet features include individually variable column widths, protected cells, a programming facility plus a wide range of maths functions.

- ■ Supports virtually any printer –CBM, EPSON, JUKI, BROTHER, OLIVETTI and many others.
- ■ Parallel printers require ONLY a low-cost cable.

- ■ Include information directly into the Worksheet from VizaWrite and almost any other system.
- ■ Simultaneous display of worksheet and line or bar graphs.

- ■ Worksheet manipulation lets you Search, Sort, Copy, Move, Delete and Insert by row, column or a range.
- ■ Text editing facilities for letters, invoices, report headings etc.

VizaStar integrates three important electronic aids to your business or home office.

A fast and easy-to-use package – VizaStar is a comprehensive information processor that includes an electronic worksheet, information filing system and simultaneous on-screen graphics.

VizaStar has been designed to incorporate the very latest in user-friendliness – so now you can handle your all-important information in many new ways and in a quick and effective manner.

The information filing capabilities of VizaStar enable you to store your information onto disk in an ordered and instantly retrievable form. This means that you can quickly pick out individual or entire groups of related information to create lists, statements, labels or reports.

VizaStar is the ONLY program of its kind on the Commodore 64. Completely consistent with the VizaWrite word processor, VizaStar provides a totally comprehensive office system.

VizaStar costs just £99.95 (incl. VAT) from your computer dealer and selected stores. Please write for more details and the name and address of your nearest dealer.

VIZA
SOFTWARE

VIZA SOFTWARE, 9 MANSION ROW,
BROMPTON, GILLINGHAM, KENT ME7 5SE
TEL: MEDWAY (0634) 813780
Dealer enquiries welcome.

AVAILABLE NOW- VIZASTAR 64
£99.95
(inc VAT)

```
10 I=49492:T=0
20 READA:IFA=-1THEN50
30 POKEI,A:I=I+1
40 T=T+A:GOTO20
50 IFT<>32027THENPRINT"▩▩CHECKSUM ERROR:"32027,T:END
60 PRINT"▩▩USE SYS49492,/STRING/ TO FIND STRING"
70 PRINT"▩▩":END
100 DATA32,253,174,32,99,194,133
110 DATA89,162,0,32,127,193,32
120 DATA157,193,120,169,23,141,0
130 DATA3,169,194,141,1,3,88
140 DATA32,171,193,32,24,194,32
150 DATA177,193,76,115,193,76,8
160 DATA175,32,93,194,240,248,197
170 DATA89,240,13,157,128,191,232
180 DATA224,64,208,239,162,23,76
190 DATA55,164,169,0,157,128,191
200 DATA134,34,96,165,43,24,105
210 DATA2,133,87,165,44,105,0
220 DATA133,88,96,162,0,160,2
230 DATA132,35,165,1,41,254,133
240 DATA1,177,87,221,128,191,8
250 DATA165,1,9,1,133,1,40
260 DATA208,7,200,232,228,34,208
270 DATA229,96,230,35,164,35,162
280 DATA0,177,87,240,3,76,177
290 DATA193,165,87,56,233,2,133
300 DATA87,165,88,233,0,133,88
310 DATA160,0,177,87,133,89,200
320 DATA177,87,133,88,5,89,240
330 DATA16,165,89,24,105,2,133
340 DATA87,165,88,105,0,133,88
350 DATA76,171,193,104,104,32,93
360 DATA194,120,169,139,141,0,3
370 DATA169,227,141,1,3,88,96
380 DATA160,0,165,34,141,104,194
390 DATA165,35,141,105,194,165,87
400 DATA141,106,194,165,88,141,107
410 DATA194,169,145,32,210,255,177
420 DATA87,133,20,200,177,87,133
430 DATA21,32,19,166,32,201,166
440 DATA173,104,194,133,34,173,105
450 DATA194,133,35,173,106,194,133
460 DATA87,173,107,194,133,88,230
470 DATA35,164,35,162,0,96,230
480 DATA122,208,2,230,123,160,0
490 DATA177,122,96,0,0,0,0,-1
```

Find:

This routine will find any and all occurrences of a string or command in a Basic program. When the comparison has been found, the line on which it was found will be listed to the screen and it will search for the next occurrence.

To call the Find routine, use SYS49492,dstringd. This will find all occurrences of string in the program. d is a delimiter character that marks the start and the end of the find string. This can be any character that is not in the string. The usual character to use is '/' but if the string 'PRINT' was to be found instead of the command, use the " character as d.

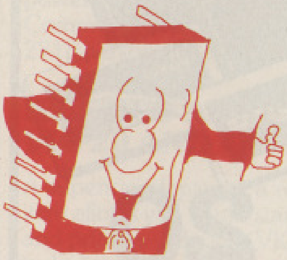
```
C154   20FDAE     JSR   $AEFD
C157   2063C2     JSR   $C263
C15A   8559       STA   $59
C15C   A200       LDX   #$00
C15E   207FC1     JSR   $C17F
C161   209DC1     JSR   $C19D
C164   78         SEI
C165   A917       LDA   #$17
C167   8D0003     STA   $0300
C16A   A9C2       LDA   #$C2
C16C   8D0103     STA   $0301
C16F   58         CLI
C170   20ABC1     JSR   $C1AB
C173   2018C2     JSR   $C218
C176   20B1C1     JSR   $C1B1
C179   4C73C1     JMP   $C173
C17C   4C08AF     JMP   $AF08
C17F   205DC2     JSR   $C25D
C182   F0F8       BEQ   $C17C
C184   C559       CMP   $59
C186   F00D       BEQ   $C195
C188   9D80BF     STA   $BF80,X
C18B   E8         INX
C18C   E040       CPX   #$40
C18E   D0EF       BNE   $C17F
C190   A217       LDX   #$17
C192   4C37A4     JMP   $A437
C195   A900       LDA   #$00
C197   9D80BF     STA   $BF80,X
```

MACHINE CODE

```
 29   C19A   8622     STX  $22
 30   C19C   60       RTS
 31   C19D   A52B     LDA  $2B
 32   C19F   18       CLC
 33   C1A0   6902     ADC  #$02
 34   C1A2   8557     STA  $57
 35   C1A4   A52C     LDA  $2C
 36   C1A6   6900     ADC  #$00
 37   C1A8   8558     STA  $58
 38   C1AA   60       RTS
 39   C1AB   A200     LDX  #$00
 40   C1AD   A002     LDY  #$02
 41   C1AF   8423     STY  $23
 42   C1B1   A501     LDA  $01
 43   C1B3   29FE     AND  #$FE
 44   C1B5   8501     STA  $01
 45   C1B7   B157     LDA  ($57),Y
 46   C1B9   DD80BF   CMP  $BF80,X
 47   C1BC   08       PHP
 48   C1BD   A501     LDA  $01
 49   C1BF   0901     ORA  #$01
 50   C1C1   8501     STA  $01
 51   C1C3   28       PLP
 52   C1C4   D007     BNE  $C1CD
 53   C1C6   C8       INY
 54   C1C7   E8       INX
 55   C1C8   E422     CPX  $22
 56   C1CA   D0E5     BNE  $C1B1
 57   C1CC   60       RTS
 58   C1CD   E623     INC  $23
 59   C1CF   A423     LDY  $23
 60   C1D1   A200     LDX  #$00
 61   C1D3   B157     LDA  ($57),Y
 62   C1D5   F003     BEQ  $C1DA
 63   C1D7   4CB1C1   JMP  $C1B1
 64   C1DA   A557     LDA  $57
 65   C1DC   38       SEC
 66   C1DD   E902     SBC  #$02
 67   C1DF   8557     STA  $57
 68   C1E1   A558     LDA  $58
 69   C1E3   E900     SBC  #$00
 70   C1E5   8558     STA  $58
 71   C1E7   A000     LDY  #$00
 72   C1E9   B157     LDA  ($57),Y
 73   C1EB   8559     STA  $59
 74   C1ED   C8       INY
 75   C1EE   B157     LDA  ($57),Y
 76   C1F0   8558     STA  $58
 77   C1F2   0559     ORA  $59
 78   C1F4   F010     BEQ  $C206
 79   C1F6   A559     LDA  $59
 80   C1F8   18       CLC
 81   C1F9   6902     ADC  #$02
 82   C1FB   8557     STA  $57
 83   C1FD   A558     LDA  $58
 84   C1FF   6900     ADC  #$00
 85   C201   8558     STA  $58
 86   C203   4CABC1   JMP  $C1AB
 87   C206   68       PLA
 88   C207   68       PLA
 89   C208   205DC2   JSR  $C25D
 90   C20B   78       SEI
 91   C20C   A98B     LDA  #$8B
 92   C20E   8D0003   STA  $0300
 93   C211   A9E3     LDA  #$E3
 94   C213   8D0103   STA  $0301
 95   C216   58       CLI
 96   C217   60       RTS
 97   C218   A000     LDY  #$00
 98   C21A   A522     LDA  $22
 99   C21C   8D68C2   STA  $C268
100   C21F   A523     LDA  $23
101   C221   8D69C2   STA  $C269
102   C224   A557     LDA  $57
103   C226   8D6AC2   STA  $C26A
104   C229   A558     LDA  $58
105   C22B   8D6BC2   STA  $C26B
106   C22E   A991     LDA  #$91
107   C230   20D2FF   JSR  $FFD2
108   C233   B157     LDA  ($57),Y
109   C235   8514     STA  $14
110   C237   C8       INY
111   C238   B157     LDA  ($57),Y
112   C23A   8515     STA  $15
113   C23C   2013A6   JSR  $A613
114   C23F   20C9A6   JSR  $A6C9
115   C242   AD68C2   LDA  $C268
116   C245   8522     STA  $22
117   C247   AD69C2   LDA  $C269
118   C24A   8523     STA  $23
119   C24C   AD6AC2   LDA  $C26A
120   C24F   8557     STA  $57
121   C251   AD6BC2   LDA  $C26B
122   C254   8558     STA  $58
123   C256   E623     INC  $23
124   C258   A423     LDY  $23
125   C25A   A200     LDX  #$00
126   C25C   60       RTS
127   C25D   E67A     INC  $7A
128   C25F   D002     BNE  $C263
129   C261   E67B     INC  $7B
130   C263   A000     LDY  #$00
131   C265   B17A     LDA  ($7A),Y
132   C267   60       RTS
133   C268   00       BRK
134   C269   00       BRK
135   C26A   00       BRK
136   C26B   00       BRK
```

Mr. Chip

SOFTWARE



VIC 20 GAMES AND UTILITIES

JACKPOT:
This is it, the ultimate fruit machine for the VIC with nudge, hold and respin, 100% machine code. "Overall jackpot is a beautifully written simulation giving superb graphics, animation and use of colour. In fact, this programme makes Commodore's fruit machine cartridge look unbelievably cheap and nasty." Home Computing Weekly No. 20 19th July 1983 .... **£5.50**

KWAZY KWAKS:
Accuracy and speed are required for this shooting gallery, superb use of colour and graphics in this new and challenging game from the author of "JACKPOT", 100% machine code program, to the same high standard, joystick or keyboard control. For the unexpanded VIC **£5.50**

PACMANIA: Choose your own game from the following options – difficulty 1-3, speed 1-3, size of maze 1-3, visible or invisible maze, still or moving power pills, define your own key controls, any combination, if this is your type of game, then this is the one for you, for the 3K expanded VIC only **£5.50**

BUGSY (Joystick Only) This is a Minefield with a difference! As you step on the stones whilst collecting purple boxes which give you both time and points, they disappear from beneath your feet. DO NOT DESPAIR! "BUGSY" will randomly replace the stones but avoid bumping into him or its sudden death! An original, compulsive and challenging game **£3.50**

MINI-ROULETTE – PONTOON – HI-LOW Three great games of chance for the VIC, try to beat the computer, hours of fun, full colour, sound effects and tunes **£5.50**

Full documentation with all utility programs

Other software for the VIC 20 and Commodore 64, send large envelope SAE for free colour brochure, including

RABBIT SOFTWARE at £5.00

COMMODORE 64 GAMES AND UTILITIES

JACKPOT 64:
At last its here, specially written for the 64, by the author of "JACKPOT" the ultimate Fruit Machine program for the VIC (available from 1st Nov) **£5.50**

WESTMINSTER:
A game for up to four players, can you lead the party of your choice and win the general election, you tour the 60 consituencies (seats) buying votes, when you can, (just like the real thing!), this must be one of the first board type games specifically written for the computer, why play on your own, have fun with your family and friends playing WESTMINSTER **£5.50**

RED ALERT:
A game for 1-4 players, with sound and graphics. Make money in casinos, commit robbery, hide from the police, hire secret agents, (some of whom can be treacherous), negotiate for weapons, find and attack the secret rocket base to launch the missile, and watch the havoc and destruction caused. There's no turning back from "RED ALERT" **£5.50**
(available from 1st Nov)

WH££LER DEALER:
A game for two to twenty players, become a tycoon of the motor trade, you must obtain gearboxes, tyres and engines to produce cars for sale. Form syndicates, buy and exchange parts, buy dealerships, but be careful, you may become bankrupt and have to liquidate, find out what you're made of, have you got what it takes to become a WH££LER DEALER **£5.50**

LUNAR RESCUE:
Our new version, avoid the asteroid belt, to rescue the stranded scientists, then fight your way back to the mother ship, fast reactions are required to safely land and dock your lunar module **£5.50**

CHIPMON:
Contains a 1/ or 2/ Pass Assembler Disassembler and Monitor, a programming aid for the development of machine code programs and routines on the CBM 64

Tape Version	**£12.50**
Disk with extra features	**£15.00**

PURCHASE LEDGER:
Easy to use, single entry, handles 400 invoices per month,

Gross/Nett purchases, V.A.T.	**£14.50**
Disk Version	**£17.00**

(available from 1st Nov)

SALES LEDGER As above

Send Cheques/PO's to: MR. CHIP SOFTWARE
DEPT CC, 1 NEVILLE PLACE LLANDUDNO,
GWYNEDD LL30 3BL. TEL: 0492 79026

All our programs are now available on disk. Please allow £2·50 extra.

DEALER ENQUIRIES WELCOME

WANTED – High quality software of all types for export and UK distribution.

ADMAN ELECTRONICS

SPEECH SYNTHESISER NOW AVAILABLE FOR COMMODORE 64 PRICE AROUND £49.95
Speech Synthesiser now available
16K Ram Pack
3 Port Expansion Motherboard
Speech Synthesiser
8K Ram Pack
VIC 20

Add on the Adman way

The Vic 20 really can speak...but only if you use an ADMAN SPEECH SYNTHESISER It's word power is endless as there is no set vocabulary. Yet operation is simple. The 64 elements of English speech are pre-programmed to let you put your own words together as soon as you switch on. Just imagine...program adventure games with characters that can actually talk!

Also for your Vic 20 there are 8K and 16K RAM PACKS and the ADMAN 3 PORT EXPANSION MOTHER BOARD. With proven designs of the highest quality they are the best value for money around.

The Vic 20 speaks out!

Available from Spectrum, Dixons and other major computer accessory shops

Prices around:

8k Ram Pack	£29.95
16k Ram Pack	£39.95
Motherboard	£19.95
Speech Synthesiser VIC 20/64	**£49.95**

To find out more about these products, why not take a lead from our speech synthesiser...go to your local dealer and ask for it! Or post the coupon.

Dept. C, Adman Electronics Ltd., Ripon Way,
Harrogate, N.Yorks, HG1 2AU. Tel. 0621 740972

Please send me information on Adman Vic 20 Accessories

Name ____________________

Address ____________________

____

Adman Electronics Ltd. is a member of the Adam Leisure Group PLC

HOTEL SYSTEM

We are pleased to introduce our NEW HOTEL ACCOUNTING SYSTEM incorporating:-

This system was designed by a hotelier for hotels. Terms are posted automatically on each date change along with any morning tea or newspaper orders.

GUEST BILLING features Automatic Tariff and a price look-up for 1000 items.

STOCK CONTROL keeps full records of Stock and Sales and will produce Stock Lists, Low Stock Reports, Order Forms etc.

Full GUEST RECORDS are stored, showing Name and Address, Last Arrival and Departure Dates, Last Room Occupied, Amount of Last Invoice, Number of Stays and the Total Amount Spent. These can be viewed when necessary.

The WORD PROCESSOR can be used for producing Daily Menus, Wine Lists, Memos, Arrival and Departure Lists and Circular Letters.

Information from the main GUEST RECORDS or FILING SYSTEM files can be automatically inserted into Letters.

The price for this complete system, the computer, floppy disk drives, printer, first 2000 bill sheets and staff training is from **£2745** + VAT, depending on choice of printer.

Now available on Commodore 700 series from **£3250** + VAT

For further information please contact Paul Southcott on 0323 843737.

Our reservation package is now available – only on 700 at present.

Southcott Software Services

Glyndley Manor, Hankham, Pevensey, East Sussex BN24 5BS
Telephone: (0323) 843737 Telex: 877440 Ref. SSS

INFODISK 64

the friendly data-base for home or office.

• Records up to 2400 characters and 180 fields • Up to 9 screen pages per record • Report generator • 19 function calculator • Almost instant retrieval of any record • Links to most word-processors • Six ready-to-run applications and single disk utility included • Very easy to use •

All for £75 (USA : $89.95)

INFOTAPE

• store up to 3000 data items (fields*records) with this totally flexible and versatile tape system which includes a 19 function calculator and report generator for creating mailing labels and tabular reports...£16.95 ($ 29.95USA)

UK prices include VAT; MD residents add 5% tax. P & P included

Dealer enquiries welcome UK & USA

To: BEAVER SOFTWARE SYSTEMS
UK: Stathern, Melton Mowbray, Leics. LE14 4HJ
USA: PO Box 88, Cabin John, Maryland 20818
Please send further details about INFODISK 64/INFOTAPE
Name............................Address..
....

OFFICIALLY APPROVED BY COMMODORE

EPROM PROGRAMMER MK3

This advanced version of our Mk.2 Programmer will program the popular industry standard 2516, 2716, 2532, 2732, 2564, 2764, and 27128 EPROMS. Disk-based software with all the essential functions for fast and reliable EPROM programming. 14 functions including Check-Empty, Program, Verify, etc; plus 6502 Disk Assembler and Assembler Hex-File loading (CBM or JCL Assemblers). With built in power supply and new custom case, this is the Programmer Commodore use at Slough! Price £299+VAT including 2716 personality card.

IEEE BUS-ADAPTOR FOR VIC 20 AND CBM 64

A superior adaptor at a reasonable price. This brand-new item allows you to use standard CBM/PET IEEE disk drives and printers with your VIC or 64. Many advanced features including:

- ★ MINI-DOS support
- ★ Batch file loading
- ★ Gold-plated edge connector for long term reliability
- ★ Selectable default device number for load/save
- ★ Multi-user bus sharing and simultaneous use of the serial bus.

Supplied with instructions detailing these features plus many more. Price £59+VAT.

OFFICIALLY APPROVED BY COMMODORE

JCL 700 WORKSHOP

Superb NEW cartridge for the CBM 700. Your programs will become faster, more reliable, smaller and much easier to write!

- ★ 10 TOOLKIT-type programming aids.
- ★ Bi-directional screen scrolling.
- ★ Enhanced BASIC with 39 new KEYWORDS.
- ★ Comprehensive data input systems with efficient File Interfacing.
- ★ DOS-SUPPORT available all the time.
- ★ ASCII-editor for text and assembler files.
- ★ Elementary word processing facilities.
- ★ BANK-SYS, Kernal in every bank.
- ★ Design and add your own BASIC extensions.
- ★ Extra RAM in system bank.
- ★ Comprehensive manual.

Available now, price £120.00 + VAT.

BUSINESS ROM

The BUSINESS ROM for 4000/8000 Commodore Machines adds 25 additional keywords to BASIC. Super screen management & input systems coupled with efficient easy-to-use relative file handling . . . and more. Includes DOS-support. Used by many major UK companies who require the best! Price £80.00 + VAT.

ROM PAGER

ROM PAGER boards for 3000/4000/8000 machines give 8 extra expansion sockets for ROMs or EPROMS, easy to fit, leaves user port free. Price £45.00 + VAT.

JCL SOFTWARE
47 London Road, Southborough,
Tunbridge Wells, Kent.

Phone 0892-27454
for data-sheets or
contact your nearest
Commodore dealer.

READY NOW!

complete software packages for car fleet management

Car Fleet Control are leaders in vehicle fleet control systems on micro computer. In addition to designing and installing complete systems to suit each customer's exact requirements, which we have been doing for years, we now market a range of standard well proven software packages for IBM PC or Commodore 8032.

These systems are suitable for single or multi terminal operation, floppy or hard disc. For anything to do with vehicle fleet management contact us today.

We will send brochures or arrange a demonstration.

Car Fleet Control
fleet management at your finger tips

Car Fleet Control Limited
Cannon House,
2255 Coventry Road,
Sheldon,
Birmingham B26 3NX
Tel: 021-742 8771

NEW
CBM64
1403.25

SPECIAL OFFER for CBM 64

80-COLUMN/GRAFICCARD

- Digital clock
- Mixpossibility of 80-column screen with Hires CBM64-screen (also in colour)
- Grafic pictures; can be switched to background
- Upper line can be locked (for comments etc.)
- Adjustable line spacing for greater clarity on text screens

FREE ADDED ! : Sophisticated Wordprocessor with extended manual

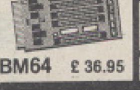
£ 59.95

★ Warning: Beware of (inferior) imitations of ZERO-products!

...Surprising bargains for VIC 20 and CBM 64

- **EXPANSION UNIT** with 2 slots £ 5.95

- **EPROM CARD** two 2k/4 k EPROM sockets. Addresses are changeable. £ 5.95
- **40/80 COLUMN CARD** Turn your VIC 20 into a professional computer. 40 or 80 columns instead of 22, very sharp and stable picture, Try it out without obligation! £ 55.95
- **EPROM PROGRAMMER** for 2716, 2732, 2764, 27128, 2532 EPROMS. Can be easily connected to your computer. Control software in EPROM £ 6.50 £ 31
- **64 k RAM + 2 k EPROM** With software for RAM-files. Easily connected. £ 55.95
- **EPROM-ERASER** erases 4 EPROMS simultaneously £ 26.50



- **EXPANSION UNIT** With 5 slots, fully buffered, switches for deselecting slots, and on-board power supply VIC 20 £ 29.95 ✻ CBM64 £ 36.95
- **MACH3 PRINTER BUFFER**

	16 k	32 k	48 k
par. input - par. output	£ 86	£ 98	£ 109
serial input - par. output	£ 94	£ 109	£ 123

for all our products: Dealer inquiries invited.

zero ELECTRONICS

- All prices exclude VAT. Shipping costs £ 1.50
- Supplier to schools, universities and government departments.
- We have good documentation of all our products, free of charge.
- All equipment can be tried out without obligation; if returned undamaged within 10 days, you only pay postage and packing costs. .

149 KINGSTREET • GT. YARMOUTH NR30 2PA • TEL:(0493) - 2023
(NASH HOUSE)

NOW AVAILABLE WITH SOFTWARE-CONTROLLED OVERNIGHT VIDEO BACK-UP

HARDBOX—Hard Disks for Commodore Micro-Computers

on
Small Systems Engineering Limited
HARDBOX
CORVUS SYSTEMS

HARD DISK INTERFACE
HARDBOX is the intelligent controller that lets you add a Corvus hard disk drive to your Commodore computer. In fact, you can chain up to 4 hard disk drives of 6, 11 or 20 Megabyte capacities.

Compatible with CBM DOS versions 1 and 2, the HARDBOX operates with existing Commodore programs and appears to the Commodore as a high speed, high capacity floppy drive.

Multi-User System
Create a multi-user network by adding the Corvus Constellation multiplexer to your hard disk system. With a HARDBOX at each work station, up to 64 users can simultaneously access the same drive.

As a multi-user system, the HARDBOX provides:

- Separate user areas on each hard disk.
- Multi-user work areas for shared programs.
- File and record locking for shared databases.
- Password protection of user areas.
- Access to any user area from any station using the password.

Video Cassette Backup
The HARDBOX supports the Corvus *Mirror Option.* This provides a high-speed, low cost means of backup, using a commercial video cassette recorder. Backup speeds of 7½ kilobytes per second let you save contents of a 10 MByte drive in less than 20 minutes. Video cassette capacity is approximately 100 Megabytes.

Hardware Requirements

- Commodore 3000, 4000, or 8000 series computer with BASIC 2 or 4.
- One HARDBOX and PET-IEEE cable per work station.
- Corvus bare drive and ribbon cable.
- Access to a floppy disk or cassette.

Price..£495.00

small systems engineering limited
2-4 Canfield Place, London NW6 3BT. Telephone: 328 7145 Telex 264538

Distributed in the UK by:
Carfleet Control, Ltd., Cannon House, 2255, Coventry Road, Sheldon, Birmingham B26 3NX. Tel: 021-742 8771.
Computer Sales and Software Centre, Ltd., 190/192, Cranbrook Road, Ilford, Essex IG1 4LU. Tel: 01-554 3344.

ISG expand service

To cope with a growing demand for the after-sales servicing of computers and related products, ISG Data Sales have expanded their technical services and maintenance departments. Centres have opened in Manchester and Birmingham.

ISG currently provide an independent 24 hour service for Commodore micros as well as a range of printers, terminals and disk drives. Emergency call outs and contract service work are dealt with.

Contact: ISG Data Sales, Wellington Industrial Estate, Basingstoke Road, Spencers Wood, READING RG7 1AW. Tel: 0734 884666.

Analog Input
Analog Output
3D Digital Design and Development

3D's industrial interface

Digital Design and Development (3D) have introduced the GPIS (General Purpose Interface System), an interface designed specifically for low budget industrial applications. It retails at £700 + VAT.

It offers a combination of analogue inputs and outputs with 12 bit resolution. In addition there is an 8 bit port for digital inputs and one that provides an open collector Darlington stage. The system is self-contained with integral power supplies, connectors, indicators and a ribbon connector to the CBM 64 memory expansion port.

Contact: 3D Digital Design and Development, 18/19 Warren Street, LONDON W1P 5DB. Tel: 387 7388.

Qume graphics terminal

The QVT 211 GX, a Qume terminal from ISG Data Sales combines graphics capabilities with normal business computing features. It retails at £950.

On the adjustable 14 inch screen, the QVT 211 can display the separate and independent graphics memory at the same time as its alphanumeric memory. It has its own built-in graphics mode plus a menu set up mode instead of Dip switches.

Contact: ISG Data Sales Ltd, Wellington Industrial Estate, Basingstoke Road, Spencers Wood, READING, RG7 1AW. Tel: 0734 884666.

Legal system

Cortex Computer Systems have just introduced Lawcomm, a system suitable for use in a small practice. It enables solicitors to extract information from the Eurolex legal database.

The complete configuration, designed for the 8000 series, costs under £4000 and includes 2 MB disks, daisy wheel printer, modem and the communication software. Other functions include word processing, budgeting, time recording and accounting software can be used on the system.

Contact: Cortex Computer Systems Ltd, Cortex House, 5 Union Street, BEDFORD. Tel: 0234 217721/2.

Modular mate

A modular version of their officeMate Accounting software has been developed by the Micro Computer Centre. The modules vary in price, but the full system costs £1700.

The Modules include the Cash Book, Sales Book, Purchase Ledger, Nominal Ledger, and a Payroll. Altogether there are 382 different modules. Each of these can be bought individually or linked to provide a totally integrated accounting system. The system can be tailored to fit the customers needs.

Only one working disk is needed as all the modules can be incorporated onto the original disk. The software is menu driven and includes a main menu and the appropriate sub-menus.

Contact: Micro Computer Centre, 28 Sheen Lane, LONDON SW14. Tel: 878 7044/5/6/7.

Free brochures

The Computer Supplies Company are giving out free colour brochures on fire proof safes, cabinets and computer accessories.

Floppy disks and magnetic tapes are becoming increasingly popular as the media on which important business information is stored, but fire is a threat and years of work could be wiped out in minutes.

Contact: Unit 23 Henlow Industrial Estate, HENLOW, Bedfordshire, SG16 6DS. Tel: 642 813511.

Sales training course for dealers

Systemate Ltd have launched a sales training course, specifically for computer dealers. Starting on a Friday morning, the delegates are taken through three intensive days, finishing on Sunday evening.

The course price of £250 per person includes meals and accommodation. Wives (or husbands) and children are accommodated free of charge and the courses are held in the most convenient Holiday Inn for all the participants.

The basic selling skills are taught along with role playing exercises. Emphasis is laid on the pre-approach work and after sales service. Professional presentation and customer relations are also discussed.

Contact: Systemate Ltd, 77 Laleham Road, STAINES, Middlesex. Tel: 0784 62588.

Long distance driver

Data transmitted over distances of more than 30m tends to corrupt or deteriorate in quality, so Inmac developed the Datadriver which could solve the problem. Two versions are available; a pair powered from the mains, retailing at £349 and a self contained pair powered from pins 9 and 10 of the computer at £289.

One datadriver is plugged into the RS232 socket and the other is attached to the peripheral. A thin flexible cable links the two. The peripherals can be located up to a mile apart.

Contact: Inmac (UK) Ltd, Davy Road, Astmoor, RUNCORN, Cheshire, WA7 1QF. Tel: 09285 67551.

Monitor

Microvitec's new Universal Monitor was launched recently. It is a colour monitor compatible with other equipment and capable of accepting inputs in different signal formats.

The Colour Monitor accepts RGB and PAL-encoded signals direct from the CBM 64 so that it can produce quality pictures and sound from a camera or videorecorder. Two screen sizes are available – the 14 inch model with the audio facility retailing at £259 + VAT and the 20 inch model with three power inputs at £385 + VAT.

Contact: Microvitec Ltd, Futures Way, Bolling Road, BRADFORD, BD4 7TU, West Yorkshire. Tel: 0274 390011.

New modems from Scicon

Scicon Ltd have introduced two new Modems, expanding their range of data communication products; the V21 Buzzbox retailing at £70 + VAT and the four function 2123 GT at £498 + VAT.

The Buzzbox operates at a speed of 300 bps and enables Commodore users to communicate with other computers and to access into a range of information networks – Viewdata, Electronic Mail for instance.

The 2123GT, a more sophisticated model operates at speeds of up to 9600 bps and has a number of facilities including error correction and auto dial.

Contact: Scicon Ltd. Tel: 01 580 5599.

Consult Zebra

Zebra Computer Services have set up a Computer Consultancy with full technical maintenance services to serve the East Midlands and East Anglia.

Large and small companies are dealt with and Commodore compatible hardware and software is supplied.

Contact: Zebra Computer Services Ltd, 9-10 St George Street, STAMFORD, Lincolnshire PE9 1BT. Tel: 0780 54695.

Worker for hire

A service providing specialist workers for the data processing industry has been started by Tangent.

Systems analysts, programmers, project managers and business analysts can be hired for use on projects or as temporary replacements for absent staff. In addition they will provide a project team to help clients augment a Data processing system.

Contact: Tangent Computer Services Ltd, Fairfield House, Fairfield Road, BRENTWOOD, Essex CM14 4LR. Tel: 0277 255755.

Paper handlers

Swingline, an American Company have produced four paper handling devices specifically for data processing; an upright and Table Top model for both the Decollator and the Burster.

The size, weight and length of the sheets that the equipment can handle varies for each model.

Contact: Swingline, 32-00 Skillman Avenue, Long Island City, N.Y. Tel: 11101/212 729 9600.

Mator dolphin for a PET

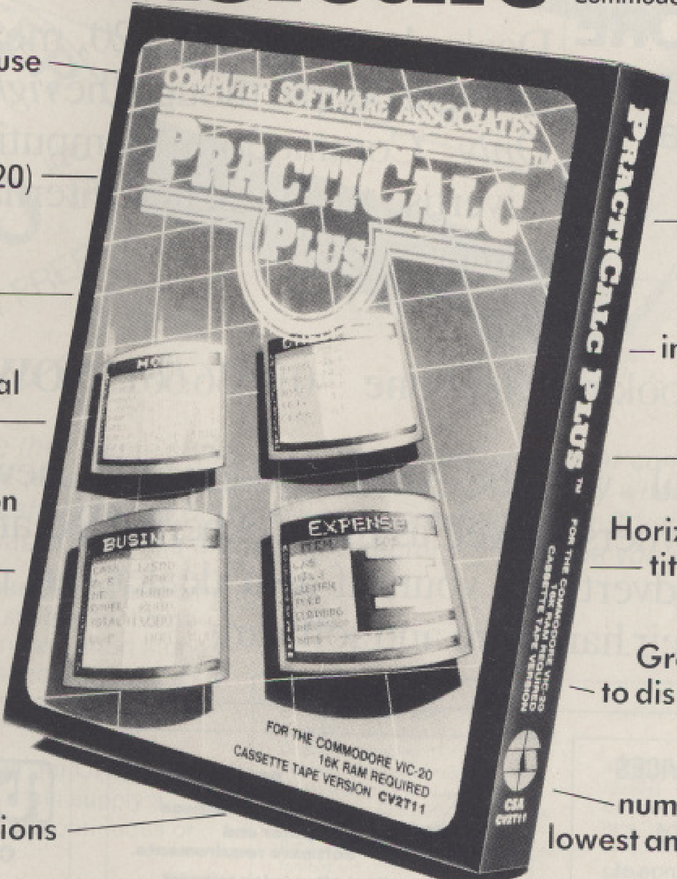
Mator Systems have added the Dolphin 3 to their range of Protocol Converter Systems.

The equipment, costing under £1000, enables users to link PET micros with IBM mainframes using 3780 and 2780 protocols. The unit also provides a simple plug-in IEEE 488 connection to the PET.

Contact: Mator Systems Ltd, 134-140 Church Road, HOVE, Sussex. Tel: 0273 720451/2.

"The greatest spreadsheet since Visicalc"

Commodore User Magazine


COMPUTER SOFTWARE ASSOCIATES
PRACTICALC PLUS
PRACTICALC PLUS™
HOME
BUSINESS
EXPENSE
FOR THE COMMODORE VIC-20
16K RAM REQUIRED
CASSETTE TAPE VERSION CV2T11
CSA
CV2T11

Clear and easy to use

2000 cells
(600 in 16K VIC 20)

Global column
width adjustment

Variable individual
column width

Insertion or deletion
of rows and
columns

Save, load and
merge
capabilities.

22 mathematical
and statistical functions

Formatting by cell
or whole sheet

Fast alpha-
numeric search

Comprehensive
instruction manual

Replication across
columns and rows

Horizontal and vertical
titles can be fixed

Graphics facility
to display your results

Powerful alpha-
numeric sort, highest to
lowest and lowest to highest

In America, Practicalc has swept to the top of the software charts. Commodore User Magazine described it as "storming American Vics as the greatest spreadsheet since Visicalc."

And no wonder since this program from Computer Software Associates provides 16K VIC 20 and Commodore 64 users with a real business spreadsheet to use at home. Sales forecasts, budgets, cashflow projections, financial modelling, are easy with Practicalc.

Now it's being stocked by Britain's leading computer stores like Boots, W.H. Smiths, Curry's Micro C, John Lewis and Spectrum dealers.

Call in and ask for a demonstration or clip the coupon for full details.

NOW AVAILABLE IN U.K. FROM JUST £29.95*

*16K VIC 20 cassette.

Another great program from

COMPUTER SOFTWARE ASSOCIATES

Name ....
Address ....
....
....

Personal enquiry (please tick) ☐ Dealer enquiry (please tick) ☐

For more information send this coupon to:
Marketing Micro Software Ltd. Goddard Road, Whitehouse Ind. Est., Ipswich, Suffolk IP1 5NP.

DEALERS DEALERS DEALERS

FRAME YOUR WAY INTO BIG BUSINESS

COMMODORE
Computing
International
DEALER
BOXES

40 mm
58 mm

Dealer boxes at only £20, means *you* advertise to the *right* people though the *right* magazine. *Only* Commodore computing can help you advertise to a local and international Commodore audience.

To make your booking telephone 01-636 6615 **NOW**

Future editorial will be directed towards new and potential Commodore owners as well as more experienced and business users. Therefore by advertising yourself as a dealer our readers will know where to buy their hardware and software.

CARIC COMPUTER SERVICES
We specialise in:
SX-64 & CBM 64
computers, **PLUS** a wide range of
supporting interfaces, peripherals,
software and supplies.
9 Woodlands Close, Penenden Heath,
Maidstone, Kent ME14 2EX
MAIDSTONE (0622) 61919

PPM LIMITED...
For all your Business Computer and Software requirements.
We offer excellent after sales support including a team of experienced service engineers.
To discuss your application contact:
David Chester on: 04867 80111
Hermitage Road, St Johns, Woking, Surrey GU21 1TZ
Telex: 850181

DERBY
CBM64 AND VIC20 DEALERS
We have the largest selection of hardware, software and books in the area.
FIRST BYTE COMPUTERS,
10 MAIN CENTRE,
LONDON ROAD, DERBY.
TEL: 0332 365280

AUGHTON
MICRO
SYSTEMS
Woodward Road, Kirkby,
Liverpool, L33 7UZ
Telephone: 051-548 6060
Telex: 628681

Y-E-S Vic 20 & 64
SALES & SERVICE
COMPUTERS
SAY YES FOR COMMODORE
HARDWARE, SOFTWARE & PERIPHERALS
YORKSHIRE
ELECTRONICS
SERVICES
LIMITED
Caxton House,
17, Fountain Street,
Morley, West Yorkshire
Tel: 0532-522181

Everyman Computers
YOUR FRIENDLY
COMPUTER SHOP
IN WILTSHIRE
VIC PRINTERS
DISC DRIVES
SOFTWARE -
DUST COVERS
BOOKS, CARTRIDGES
14 Edward Street,
Westbury, Wilts
BA13 3BD
(0373) 864644
Commodore 64 -THE BEST VALUE ON THE MARKET

A DATAPLUS OFFER
THE
SMITH-CORONA
TP-1
ONLY £250 inc VAT
DELIVERY FREE

'Dataplus have made their name supplying computer peripherals at competitive prices. I believe that we have now found the best price/performance daisy wheel alternative to dot matrix. The ideal printer for both data and word processing. Truely, a high quality machine at an affordable price. As Managing Director, I guarantee you won't buy better.'

R. Brotherhood

So make the most of your CBM64 and turn it into a quality printing system for home correspondence, documents, short stories and business use. The special interface kit required is available, see coupon.

Use standard stationery or, for ONLY £79 (if ordered with your TP1) we will supply a tractor feed so you can use continuous or fanfold paper.

This is just one offer you can't miss. To avoid disappointment RING NOW on our 24 hour answering service 0242 527412 to place your order quoting your Access/Barclaycard No., expiry date and full name and address OR complete the coupon below and POST TODAY.

Please allow 28 days delivery. If not completely satisfied return goods in original packing within 10 days of receipt and we will replace or refund your money in full.

For technical queries telephone our Expert Hotline 0242 37373 or visit our showroom at 39-49 Roman Road, Cheltenham.

DATAPLUS

SPECIFICATIONS

Print Speed: 120 wpm
Character set 128 ASCII 88 printable
Character spacing: 12 CPI
Printing: Unidirectional
Paper width: 13" max.
Writing line: 10.5" 126 character line
Line spacing: 6 lines per inch
Paper Feed: Friction, single sheet or fanfold.
240 volts, 50Hz
Dimensions: (H) 6.4" (W) 19.5" (D) 12.4"
Weight: 18.5 lbs

Operator Controls: Power on/off, top of form, impression controls (5 levels)

INTERFACES

Parallel

Centronics compatible, 7 bit parallel data, 3 control lines (data, strobe, busy, acknowledge)

Serial

RS232C compatible, 50-19200 BPS, parity and character bit length all switch selectable.

Dataplus-PSI Ltd 39-49 Roman Road Cheltenham GL51 8QQ. Reg. No. 1715271 England.
Offer open to UK only while stocks last.

To DATAPLUS-PSI Ltd 39-49 Roman Road Cheltenham GL51 8QQ
Please send me:—

Qty	Description	Price	Total
	TP1(s) with RS232 interface	£250	
	TP1 with centronic interface	£250	
	CBM 64 interface and cable kit	£39	
	Tractor Feed	£79	
	*Delete as applicable	Total	

I enclose my cheque for £ ________ crossed and made payable to DATAPLUS-PSI Ltd or charge my Access/Barclaycard* Account No.

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiry date of card ________

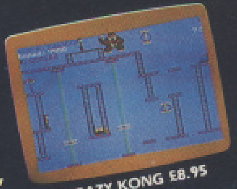
Signature ....

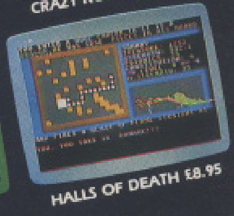
Name ....
Address ....
....
Postcode ....
Telephone No: ....
Make/Model of my computer ....
....

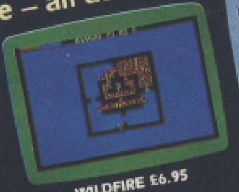
CC13

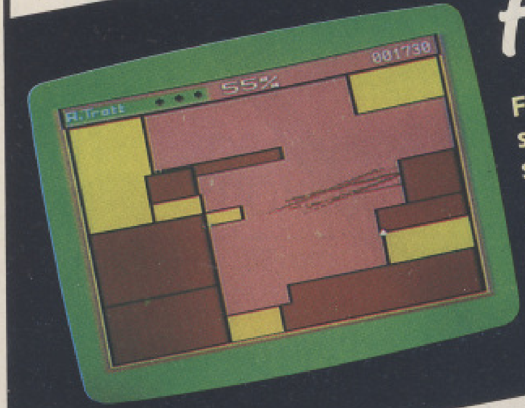
SUPERSOFT

the name to remember


CRAZY KONG £8.95

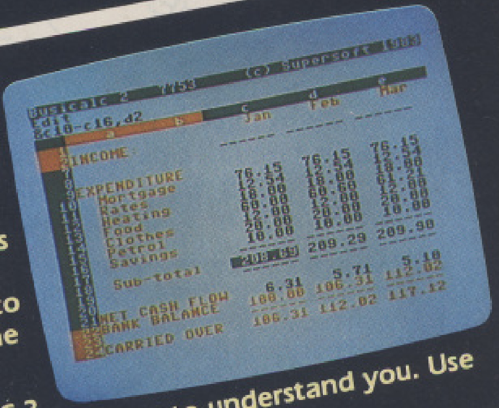

HALLS OF DEATH £8.95


WILDFIRE £6.95



for games

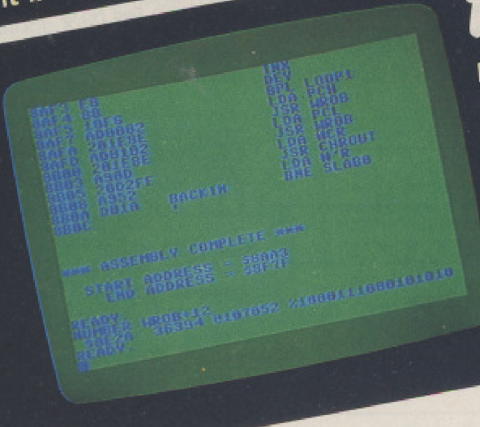
For only £8.95 you can buy a game that's exciting, soothing, and frustratingly addictive – all at the same time! STIX looks so different and sounds so different from all those other games that it will seem like being in another dimension when you sit down to play.



for business

Show your computer who's master with BUSICALC! Spreadsheet programs are used by large and small businesses to juggle with figures, prepare reports and so on. Some are very powerful indeed. The problem is that they're difficult to learn, and tricky to use – which is why we came up with the BUSICALC series.

Whether you choose BUSICALC 1, BUSICALC 2, or BUSICALC 3 you'll get a program you can understand – and one that almost seems to understand you. Use it in the home, use it for teaching, use it at work – it'll save you time and money.



for programmers

MIKRO is a full 6502/6510 ASSEMBLER with the power that professional programmers need, yet so simple to use that we recommend it to beginners! The MIKRO cartridge has many other facilities including editing commands and a machine language monitor, all for £57.50.

There's much more for the 64 in the SUPERSOFT catalogue. Ask your computer dealer for a copy, or phone 01-861 1166.

The Best 64 Software

SUPERSOFT, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex, HA3 7SJ Telephone: 01-861 1166

STORR your accounts

This month we look at two accounting packages: Storr from TM Software Systems and the Integrated Accounts System LB13 from Electronic Aids. Both operate on the 8032 with an 8050 disk drive, although the Integrated Accounts System will also run on the 8096, with a version for the 700 under development. Both have similar features (and similar drawbacks), the main difference being in price. The Electronics Aids package at £400 plus VAT, costs £350 less than TM Software' package despite having extra facilities.

STORR

STORR is the stock control and accounting system for the 8032 developed by TM Software, whose business philosophy is 'seeing is believing'.

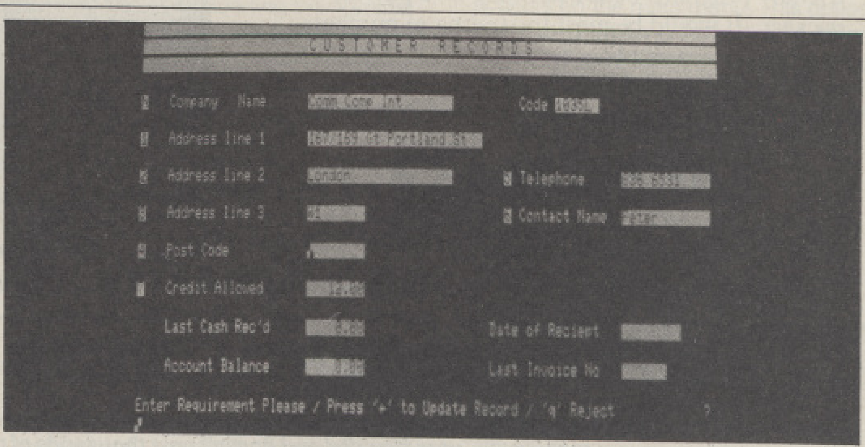
Hardware requirements are an 8032 with an 8050 disk drive and a Commodore printer. The program was written for the 8024 printer, but by changing the secondary address to seven it should be possible to use the 8023 or 8026.

Computer jargon is thankfully lacking in the manual which accompanies STORR, making it ideal for businessmen who want a quick and easy introduction to office automation.

After plugging in the dongle and loading the two disks (one containing the program, the other a demonstration disk), the first step is to enter the current date. This is simple, but it would be helpful if the cursor jumped from one input area to another rather than having to put a comma between each set of figures. However, this is the only area in the program that requires punctuation. One unnerving feature of STORR, which is common to many accounts packages, is that between the entry of the date and the screening of the main menu the screen blanks out for a seemingly long period.

There are 15 options to choose from on the main menu and, as with most systems, it is best to go through the program chronologically. If the user goes straight into some parts of the system, he will not be able to get any further due to a lack of information.

The first option on the main menu contains the system parameters, most of which are user amendable. Bypassing this option, the first major step is to create all the business records the format for which is provided on the demonstration disk. The records are protected by programmer-defined security which can be overriden by the master password.


CUSTOMER RECORDS

Company Name
Code
Address line 1
Address line 2
Telephone
Address line 3
Contact Name
Post Code
Credit Allowed
Last Cash Rec'd
Date of Reciept
Account Balance
Last Invoice No
Enter Requirement Please / Press '+' to Update Record / 'q' Reject ?

Errors made before data is saved onto disk are not easily amended. As the cursor can not be moved around the screen at the will of the user, the prefix of the line must be entered before any corrections can be made.

As this is an integrated system with data being updated as trading progresses, not all of the display is ammendable. However, this part of the system is not free from errors. In the supplier records section of this program an error in the screen layout has resulted in two locations being labelled 'number seven' – telephone numbers and credit. This means that data entered as a telephone number enters the location allocated for the amount of credit which could lead to all kinds of problems!

Once saved onto disk, data can be updated by entering the relevant account number and calling up an account.

A discount structure provides four separate price levels. Stock records also show the actual location of stock in the warehouse and the amount of VAT per item. VAT is one of the user-defined parameters in the system, which has four available VAT codes.

The number of records which can be catered for by STORR is limited by the size of the disk. However, any number of disks can be used depending on the nature and size of the business. Typical storage would be 2000 stock accounts, 500 sales accounts, purchase accounts, invoices, cash received and paid entries, and delivery blocks.

Product: Accountancy package;
Price: £750 plus VAT;
Documentation: Jargon-free manual;
Applications: Business;
Capabilities: VAT, stock control, credit control;
Minimum hardware: CBM 8032, 8050 disk drives, 8023/24/25 printer;
Company: TM Software, Address: 105 Uxbridge Road, Hanworth, Middx. TW13 5EH. Tel: 01-755 0713

“Our payroll used to take over 7 hours! Now, using a LandSoft payroll, it takes only 35 minutes!”

SAYS ESTHER OF PACEDENE.
(One of Europe’s leading screen printers and display houses)

Hasn’t *your* accounts department got enough to do without spending so long on the payroll?

LandSoft payroll programs are available for the **IBM** and **COMMODORE (CBM)** micro-computers.

Insist on seeing one of these exceptionally friendly programs before deciding on a payroll package. It would be most frustrating to purchase another system and become aware of the LandSoft excellence afterwards!

Descriptive leaflets and name of nearest dealer from:

LandSoft LS

28 Sheen Lane London SW14 8LW Tel: 01-878 7044/7

All LandSoft payrolls are written to the Inland Revenue Specification for computerised payroll systems

---

A NEW ERA IN BUSINESS SOFTWARE

If you have been frustrated looking for software that supplies ALL the facilities you require, in an integrated package that is realistically ‘user-friendly’ and doesn’t cost thousands of pounds, read on …

*First Class Integrated Software at **UNBEATABLE PRICES** for the Commodore 8032 is now available.*

Officially tested and approved commodore

‘STORR’ — FOR ALL BUSINESSES

‘STORR’ is an easy to use, step by step, complete Stock Control and Accounting system. No previous computer experience is required to make full use of this comprehensive system which comes with an extensive, easy to use instruction manual and unequalled telephone support. ‘STORR’ is invaluable in the following areas:
★ Open Item Sales and Purchase Ledgers ★ V.A.T. ★ Cash Book ★ Stock Control ★ Audit Trail ★ Stock Movements Trail ★ Reconciliations ★ Active Credit Control ★ Prints of Invoices, Ledgers, Transactions, Stock Movements, Re-order levels, Overdue Accounts, Analysis ★ Full screen displayed ledger transactions for instant enquiry ★ Cash flow control ★ A four level password code ensures complete security.

PRICE: £750.00

‘? ? ?’—FOR YOUR BUSINESS?

Contact us if you thought a tailor made system written for your company to suit your purposes would be financially unviable – you will be pleasantly surprised.

OUR GUARANTEE

If you select one of our systems for your company but require an addition to it tell us and we will modify it immediately. If the change enhances the system for other users this service will be provided absolutely FREE!

For further details write or telephone: –

TM SOFTWARE SYSTEMS LTD.
105 Uxbridge Road, Hanworth, Middlesex TW13 5EH
01-755 0713

OFFICIALLY APPROVED BY COMMODORE

DEALER ENQUIRIES WELCOME

INTEGRATED ACCOUNTS SYSTEM LB13

Emphasis on data security is one of the major advantages that Electronic Aid's Integrated Accounts System LB13 has over similar packages. In addition to a dongle which contains all of the security, it is impossible to enter the system without the correct password. And even when the user is into the main system, there are several other passwords needed before the user can enter the different sections provided by the main menu. These passwords are written and stored in code at a secret location on the disk.

Once the program has been loaded the user encounters the same problem seen in this stage of the STORR package. That is the screen is left blank for a short period and the user wonders if anything is happening.

With the disk formatted, the user has to set up the reports, invoices and ledgers, then decide on the number of accounts required before any data can be entered into the system. In this respect the program is quite large and it is possible to put 600 customer or supplier records onto one 8050 disk with a maximum of 40 invoices per record.

Again the first data to be entered is the date followed by the accounting period. The built-in calender facility displays the correct day on screen as a final check to ensure that the date entered is correct.

The next step is to set-up the invoices and ledgers. The ledger system is simply a series of records of transactions relating to the financial affairs of the business. With purchase ledgers, transactions are related to the name of the supplier, whereas with the nominal ledger all transactions are analysed between accounts where the name matches that of the transaction.

The nominal ledger includes records of money which has been borrowed or loaned and the sales ledger records invoices between the company and the customer. Because of the double entry principle operated by the ledger system, totals of unpaid purchases and sales should equal those of the opening balances on the other ledgers.

Fixed costs such as overheads, profit and loss are pre-set reports in the nominal ledger. On loading the nominal ledger program, the user gains immediate access to ledger reports enabling him to examine the audit trail, print the balances and access the cash book and nominal journals.

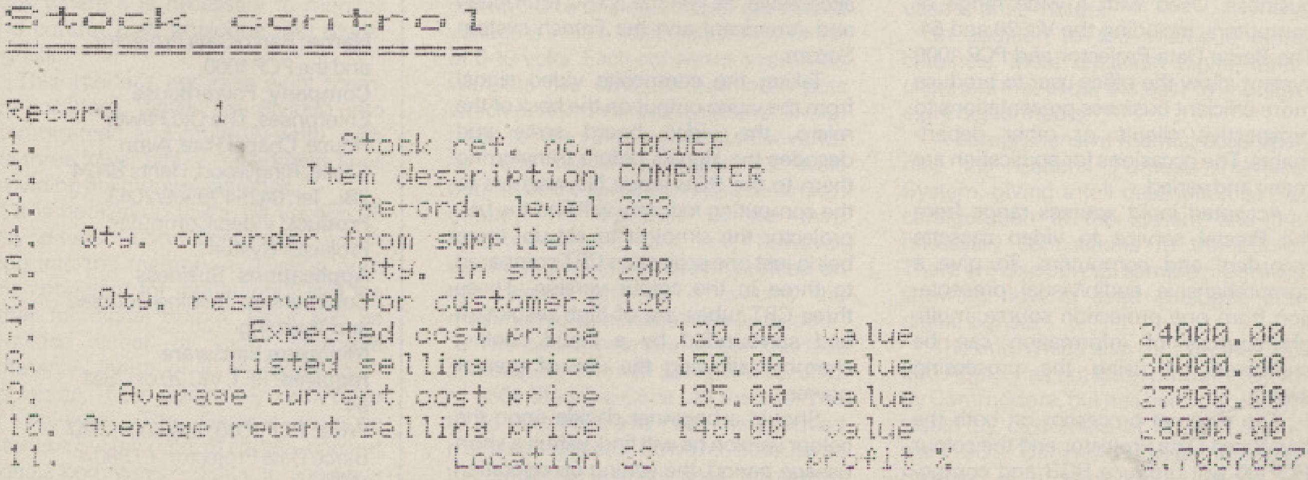
Customer records can be updated in each of the three ledgers and lists of records can be printed out.

Keeping track of current stock levels is catered for to a certain extent, but the stock control routine is not completely integrated with the rest of the package due to lack of memory. Instead, it is accessed direct from the main menu. (In order to make this routine fully integrated the user would have to sacrifice a number of nominal accounts and possibly encounter a reduction in the operating speed of the system. Therefore Electronic Aids recommend that the 700 version should be used if full integration is required.)

The stock record can be amended at this stage. When data is being amended the cursor appears at the bottom of the screen and the line number has to be entered before amendments can be made. Payroll is another area of business financial management which cannot be ignored which is incorporated in this accounting package. This routine includes all the features generally found in a payroll program. It does not, however, have any facility to erase employee records should an employee leave before the end of a tax year. The user must wait until the end of the tax year and then mark the files as vacant so that it can be used for further employees.

Another interesting section of this program is the utilities option which appears on the main menu. This option is selected when a new disk is being formatted or a backup copy is being made. Directories can be viewed on screen or printer (any Commodore printer should suffice) and the same applies to the other files.

Product: Business accounting;
Price: £400 plus VAT;
Documentation; Good manual;
Applications: Business Management;
Hardware requirements: CBM 8032, 8096 or 700 with 8050 or 8250 disk drive and any Commodore printer;
Company: Electronic Aids, Address: Mythe Crescent, The Mythe, Tewkesbury, Gloucestershire GL20 6EB. Tel: 0386 831020.

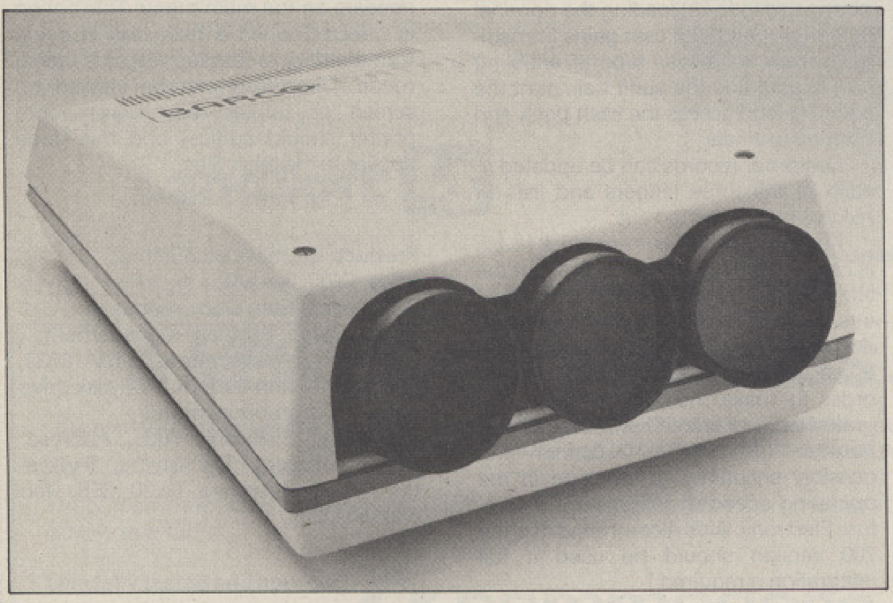


```
Stock control
=============

Record    1
1.              Stock ref. no. ABCDEF
2.            Item description COMPUTER
3.                Re-ord. level 333
4.   Qty. on order from suppliers 11
5.                  Qty. in stock 200
6.    Qty. reserved for customers 120
7.            Expected cost price    120.00  value               24000.00
8.           Listed selling price    150.00  value               30000.00
9.     Average current cost price    135.00  value               27000.00
10. Average recent selling price    140.00  value               28000.00
11.                   Location 33          profit %             3.7037037
```

Business projections

This month we look at two very different products for the business market. The GPIS from 3D is a useful tool for anyone who wants to feed normally unacceptable signals into a computer while the Powerhouse projection systems enable a huge display of the information that appears on the monitor screen.



Powerhouse Enterprises have designed a video projection system for use in business. Used with a wide range of computers, including the Vic 20 and 64. The Barco Data Projector and PCP 1000 system allow the office user to produce more efficient business presentations to prospective clients or other departments. The occasions for application are many and varied.

Accepted input sources range from the Prestel service to video cassette recorders and computers. To give a comprehensive audio/visual presentation from one projection source, multiple sources of information can be combined by using the processing switch.

The external processor on both the b/w Barco Data Projector and the colour PCP100 will produce RGB and composite video signals. Users in the U.K. are assured the standard PAL signal input (which has 625 lines per screen) will be acceptable, as will the NTSC (European and American) and the French system Secam.

Taking the composite video signal from the video output on the back of the micro, the video board sorts and decodes the signals before transferring them to the RGB input. Newcomers to the computing industry will find the b/w projector the simplest to set up, there being just one projection CRT compared to three in the colour version. These three CRT tubes are of high resolution and surrounded by a liquid cooling chamber allowing the use of greater power.

Should a beginner decide upon the colour version he will find, within a short useage period, the setting up operation to be a simple matter. With all projectors focusing is the most important aspect to be considered.

To gain the best possible effect when making a presentation with one of these machines the designers have set up a test grid consisting of the three spectrum colours.

The lines forming the grid must be matched perfectly to ensure the legibility of the projected presentation.

These projectors are hooked up to the back of a Vic 20 or a CBM 64 via an interface, (which in the case of this review was provided by Small Systems Engineering – many thanks). The interface converts the monitor output from the computer to a standard PAL signal for the projector.

The Barco Data Projector and the PCP 1000 are already used by such companies as IBM, ICL, the Wellcome Foundation, Cancer Research, BP and Shell. These machines could also be used in a teaching environment.

Name: Barco Data Projector and the PCP 1000.
Company: Powerhouse Enterprises, The Old Power House, Chapel Rise, Avon Castle, Ringwood, Hants BH24 2BL. Tel: 04254 79569/2043.
Product: Video/Computer Projector System.
Applications: Business Conferences, Training Courses and Teaching.
Minimum hardware required: PET, VIC 20 or CBM 64
Price: PCP 1000; £10,500 + VAT
Barco Data Projector; £7,900 + VAT.

From A to D

The interface reviewed here is the General Purpose Interface system from 3D Digital Design and Development, designed for use with the Commodore 64. It can also be used with the Vic-20, although this requires a different set of interface cables.

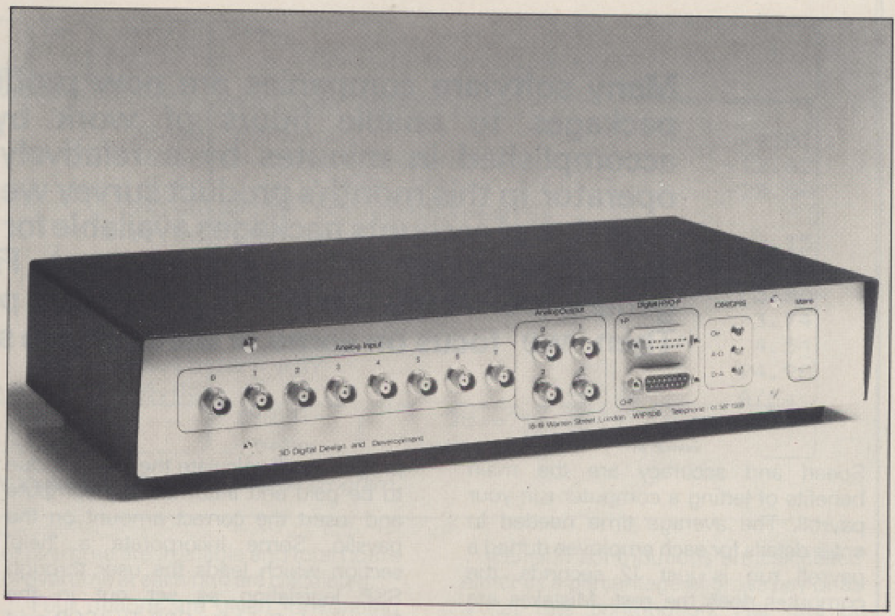
3D's General Purpose Interface System is a sophisticated piece of electronics which converts information from analogue signals to digital signals and vice versa. Until the advent of computers such conversions were hardly ever necessary, but since computers can really only understand numbers it is essential that any information to be fed into the computer is digital.

This particular interface system has been put to some interesting applications. One of 3D's OEM customers is using the General Purpose Interface System at the heart of an automatic fermentation rig, the idea being to carry out work in bio-genetics. The company experiments with different strains of fermentation germs under different conditions and monitors their growth. It has to have the ability to monitor and control both analogue and digital signals and this is where the interface system comes in.

The system is also used by the engineering department at Oxford University, and 3D says that its General Purpose Interface System is appropriate in any production or laboratory conditions where it is necessary to monitor and control both analogue and digital signals.

This interface occupies eight memory locations which are divided into memory-read and memory-write, with the three lower bits of the address lines providing the memory address.

It is hooked-up to the 64 via two 25 way d-type ribbon connectors which plug into the memory expansion port, one connector for digital input and the other for digital output. Input can be provided either by eight analogue differential inputs or 16 analogue channel inputs. These signals can be bi-polar or uni-polar. The General Purpose Interface System can, of course, convert signals both ways – digital to analogue and analogue to digital.



With the analogue to digital converter there are just two configurations. The first of these is the convertor reference voltage. Voltage to this convertor is controlled by a multi-channel potentiometer (pot) which acts as a sensitivity control. Once it has been calibrated, it is possible to set 10 conversions per second without using the on-board oscillator on the convertor. When the oscillator is used, the speed can be increased to as much as 30 conversions per second.

When digital information is being converted to analogue data, the output voltage is switch selectable from a range of 0-10 volts. Each convertor associated with the five switches has three pots which perform various functions. Two of these set the value sent to the convertor as 4095 (which provides full scale output) and 0 (whichprovides minimum output). The inclusion of the third function on the unit will, however, eliminate the voltage scale specified on the original unit as it enables the maximum output value to be exceeded.

The two convertors in the interface can be programmed using BASIC, 6502 or 6501 Machine Code. All the user has to do is to Peek and Poke the specified memory locations. However, because all the analogue signals pass through a multi-plexer before reaching the convertor the required channel must be selected before the data can reach the convertor.

Three data lines leading from the micro are used for channel selection, while a fourth is used to select which of the convertors will supply the data to the micro.

The front panel of the unit houses the eight analogue input channels, each of which has a five-way switch to select the output voltage. Each channel is capable of handling 50 volts and 400 mega amps so it is possible that the system could be used to drive motors.

In addition to the analogue input channels, there are eight digital input channels that allow the user to monitor eight digital inputs.

A comprehensive manual accompanies the General Purpose Interface System, giving a full description of the configuration of the system and the necessary connections to the micro. There are also several sample programs showing how to send analogue and digital signals.

The unit, which also runs on the BBC and Apple, has not been officially tested by Commodore, but has been rigorously tested by customers of 3D. In conclusion, 3D's General Purpose Interface System is a very useful piece of equipment for specialist applications.

8000 ways to get your

Many software companies are now producing accounts packages to enable hours of work by hand to be accomplished in minutes by a relatively inexperienced operator. In this month's product survey we take a look at a selection of accounts packages available for the 8000 series, concentrating on the payroll element. First we take a general look at the facilities provided by a payroll program. Then we focus on some of the available software.

Speed and accuracy are the main benefits of letting a computer run your payroll. The average time needed to enter details for each employee during a payroll run is just 12 seconds, the computer does the rest. Mistakes are completely eliminated as, given the correct data, a computer will always get its sums right and never looks up the wrong code number, week number or tax table. Another benefit is that a computer can provide useful statistics such as the cost of labour, hours worked, and monthly or end of year analyses.

When choosing the payroll program most suited to your business, one of the first considerations to be made is the choice of format. Programs are available on cassettes, floppy disks and hard disks. Unless you are prepared to invest in more hardware, your choice must be limited to software developed especially for your existing system.

Requirements for a payroll program will vary for different businesses, but the fundamental requirements are the same. Any payroll program should be flexible enough to accommodate differences in basic pay, tax, overtime and other variables. Statutory Sick Pay is now a legal necessity so SSP calculations are another essential feature.

Most payroll programs allow hourly, weekly and monthly paid staff to be mixed on to the same disk in any order. Overtime rates are generally set by the user, with some packages catering for anything up to 11 different rates.

The treatment of Statutory Sick Pay varies slightly but in general a payroll program will calculate the amount due to be paid and automatically compute and insert the correct amount on the payslip. Some incorporate a 'help' section which leads the user through SSP legislation as set out in the Employer's Guide to SSP. The SSP paid total is held and overall totals for the year to date are provided.

When tax codes change, the user just enters the changes for each code and then the computer automatically amends each employee's tax code. Changes in tax rates however, aren't quite as simple. Any change in legislation will require either an updated disk or a program which updates the payroll disk. (Check the service provided with individual packages).

A choice of payroll run method is offered by some programs. For example, payslip printed out after each entry; all entries made first, then continuous print run; immediate payslip run without entries; or a selection of individual employees. Payslip stationery varies with options of plain or pre-printed payslips, and pre-perforated sheets. Some packages allow you to design your own print formats. Payslips and copies are generally produced side by side so that employers' copies can be kept in a continuous strip for convenience.

To allow for the fact that a computer may suddenly be required for another use, some programs incorporate an interrupt system whereby in the middle of entering pay run information the whole system can be closed down at the touch of a key. On re-running the Pay Run program it will automatically go back to the point of the close down so that entering can continue.

For cash payments, programs can offer coin analyses indicating the required notes and coins for pay packets. Others automatically print Giro slips or cheques for employees that have been designated to be paid in that manner.

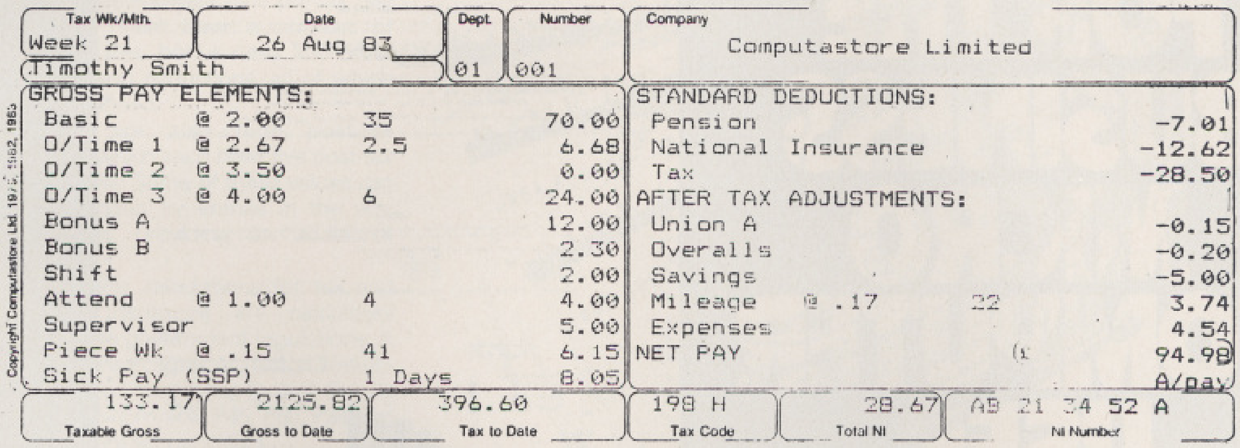
All payroll programs offer several analyses ranging from an analysis after each pay run and such liabilities as tax, National Insurance and refund of SSP at the end of each month, to a summary of the whole year's operation together with all forms required for annual returns printed automatically.

Any necessary amendments to data (change of name, bank details, rate of pay, etc.) can easily be made by those with access to the system. In the event of an employee leaving, some programs allow the user to delete the employee from the system, displaying P45 details. Others have no routine for deleting an employee until the end of the tax year. Files of employees who have left can then be re-used for a new employee.

While there is a limit to the capacity of each data disk, many systems allow the analyses from disks to be combined making the system capacity almost limitless.

Payroll packages can also cater for businesses with more than one company, all running separate payrolls. A company's name and details of how the payroll is to operate are kept on the payroll data disk, and not with the

r payroll sums right



```
Tax Wk/Mth.           Date              Dept.  Number   Company
Week 21            26 Aug 83                            Computastore Limited
Timothy Smith                           01     001
GROSS PAY ELEMENTS:                              STANDARD DEDUCTIONS:
 Basic       @ 2.00     35            70.00       Pension                                -7.01
 O/Time 1    @ 2.67     2.5            6.68       National Insurance                    -12.62
 O/Time 2    @ 3.50                    0.00       Tax                                   -28.50
 O/Time 3    @ 4.00     6             24.00      AFTER TAX ADJUSTMENTS:
 Bonus A                              12.00       Union A                                -0.15
 Bonus B                               2.30       Overalls                               -0.20
 Shift                                 2.00       Savings                                -5.00
 Attend      @ 1.00     4              4.00       Mileage     @ .17          22           3.74
 Supervisor                            5.00       Expenses                                4.54
 Piece Wk   @ .15      41              6.15      NET PAY                                 94.98
 Sick Pay (SSP)         1 Days         8.05                                              A/pay
     133.17       2125.82      396.60             198 H       28.67      AB 21 34 52 A
 Taxable Gross  Gross to Date  Tax to Date       Tax Code    Total NI    NI Number
```

Copyright Computastore Ltd. 197[illegible], 1982, 1983

A computerised payslip produced by Computastore's SuperPay payroll program.

program. This means that each company's details can be set up along with the employees' data and run using the same program.

Operation of a payroll program is always easy, but this does not mean that records can easily be tampered with. Access to data is only possible with a security password or code which can be changed when required. As a further security, some programs will only operate when a security key (provided with package) is fitted to the computer.

In conclusion, by running a computerised payroll a company can perform the essential function of paying employees with more speed and accuracy than is possible by hand. It is simple to operate and payroll records are in less danger of being tampered with than they are in a locked filing cabinet.

Officemate

Micro Computer Centre has developed a modular version of its OfficeMate accounting software system which includes a payroll module.

Designed to the Inland Revenue's Specifications for Computerised Payroll, the program covers hourly, weekly and monthly paid staff on one disk.

All tax and NI codes are covered. There are five pre-tax adjustments with descriptions and five after-tax adjustments with descriptions, two of which can be pre-set in both cases. Three rates of overtime are available and total hours of overtime at each rate are calculated.

Four options are given for running the payroll: payslip print-out after each entry; all entries first and then continuous print-out; immediate payslip print run without entries; or a selection of individual employees.

Payslips are printed out on plain paper together with a copy. Employee cost analysis in up to nine cost centres are provided. At the end of a year, the program automatically zeroes titles and P35 listings are provided. The program is suitable for contracted-out employment and mixed employment.

In the event of new legislation, Micro Computer Centre offers a service providing all the payroll updates regardless of how many there are in a year, for a fee of £50, or £25 for each payroll update required.

SuperPay

Computastore's SuperPay payroll program is designed for newcomers to computers, with memory screens guiding the user through the system.

All tax and NI codes are covered by the program which automatically calculates tax and NI for each employee for weekly, fortnightly, monthly or irregular payment periods. Up to 11 Gross Pay elements are available and five after-tax adjustments for each employee. SSP is calculated.

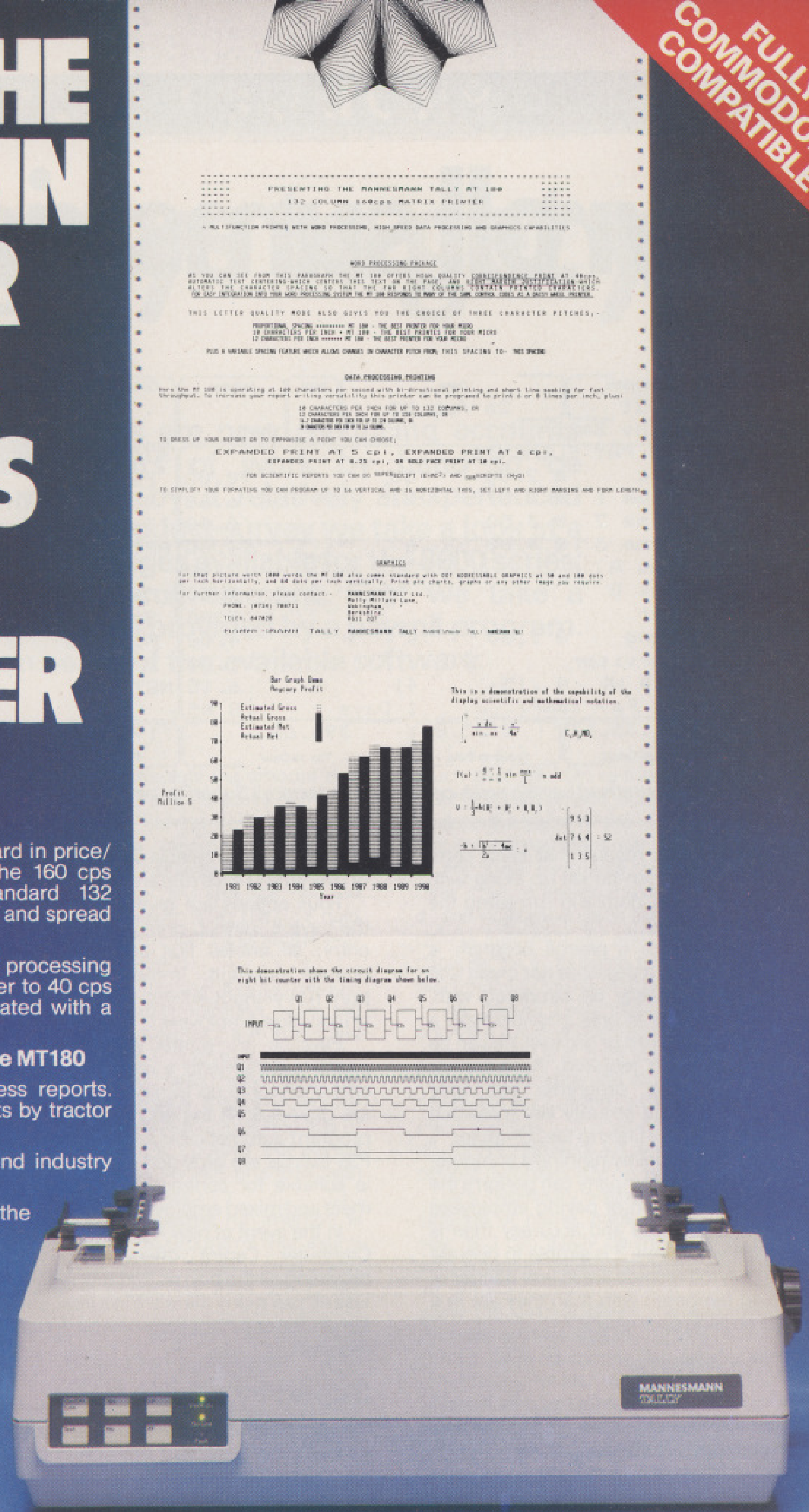
Pension contributions are calculated either as a percentage of gross pay or as a flat rate contribution. Flat rate or percentage Holiday Pay accruals can be accumulated and the tax week for either the whole payroll or individual employees can be advanced when holidays are taken. Holiday pay stamps which are taxable but not subject to NI can be entered.

Individual and departmental coin analyses are printed for those employees paid in cash. For those paid by credit transfer, SuperPay prints giros and summary listings. An employee's net pay can be rounded up or down to a convenient amount. SuperPay can also calculate each employee's net pay without stopping between payslips.

Totals for up to 20 rates of pay or adjustments (user-defined) are printed for up to 99 departments.

Year-end documents (P60, P11, P35) are printed for all employees including leavers.

In the event of budget increases, SuperPay automatically updates each employee's tax code by a fixed amount. PAYE and NI update disks are sent automatically to end-users for a small charge. All new versions of Superpay include Autopay as standard to cope with the major banks new regulations. 600 employees can be stored on a single disk.



PRESENTING THE MANNESMANN TALLY MT 180
132 COLUMN 160cps MATRIX PRINTER
WORD PROCESSING PACKAGE
THIS LETTER QUALITY MODE ALSO GIVES YOU THE CHOICE OF THREE CHARACTER PITCHES;-
DATA PROCESSING PRINTING
TO DRESS UP YOUR REPORT OR TO EMPHASISE A POINT YOU CAN CHOOSE;
EXPANDED PRINT AT 5 cpi, EXPANDED PRINT AT 6 cpi,
GRAPHICS
MANNESMANN TALLY Ltd.,
Bar Graph Demo
Estimated Gross
Actual Gross
Estimated Net
Actual Net
Profit Million $
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
Year
INPUT
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
MANNESMANN TALLY

FULLY COMMODORE COMPATIBLE

AT LAST, THE 132 COLUMN PRINTER FOR THE BUSINESS MICRO COMPUTER USER

The MT180 matrix printer is setting the standard in price/performance for the business micro user. The 160 cps gives you high throughput whilst its standard 132 column width is ideal for the latest accounting and spread sheet software.

With the MT180 you can easily use your word processing package. Just one code stream sets the printer to 40 cps correspondence quality and all codes associated with a daisy wheel printer.

And all these extra facilities are standard to the MT180

Bar charts and graphics print-out for business reports. Letter heads handled by friction and print-outs by tractor mechanism.

Problem free interfacing — buffered serial and industry standard parallel.

At Mannesmann Tally we just do not believe in the word option.

For the user we have the on-going support only a manufacturer can totally provide.

For the dealer we've set up an operation based entirely on your requirements.

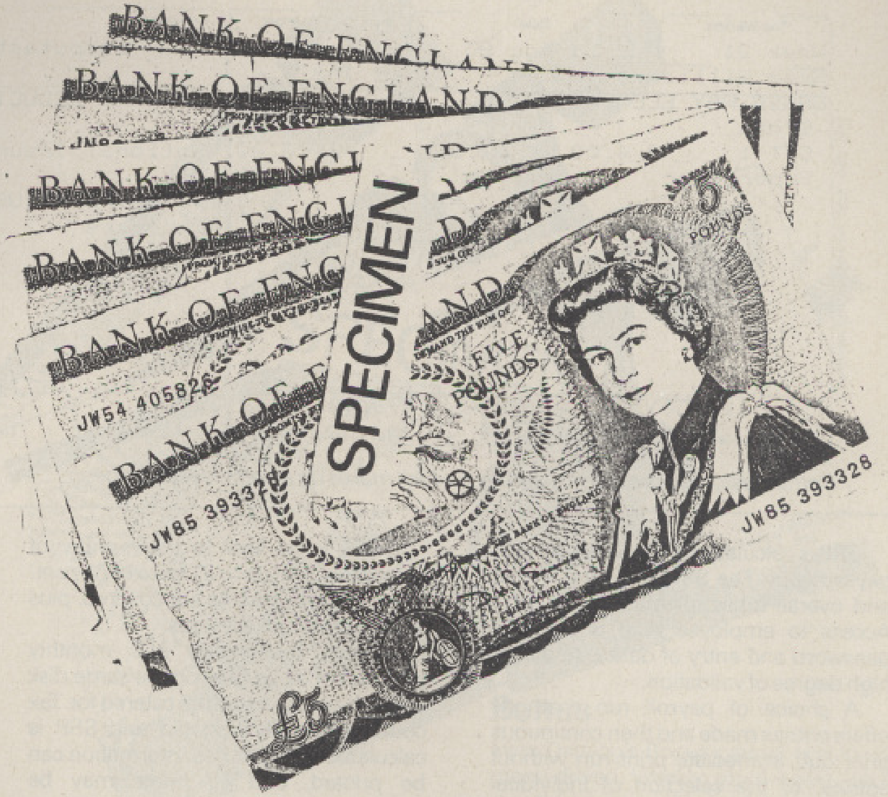
THE MT180 FROM MANNESMANN TALLY

MANNESMANN
TALLY

Molly Millars Lane, Wokingham, Berkshire RG11 2QT
Tel: (0734) 791868 Telex: 847028

M-T DIRECT

Note to microcomputer dealers — if you would like to handle these products then ring Geoff Thomas or Terry Bell on the M-T Direct lines — Wokingham (0734) 791619 and 791533.



Integrated Tabs Payroll

Raindrop Computer's Integrated TABS payroll can be used as a discrete unit, or can be integrated with the Nominal Ledger and Job Costing modules.

The system covers nine pre-tax pay schemes. These have a number of overtime rates, bonus rates and other additions and deductions, all of which are user-defined.

There are also nine post-tax schemes, which each have five post-tax adjustments. Some of these values can be over-ridden by entries in the employee file, providing an additional choice.

Automatic calculations for tax and National Insurance are calculated according to government regulations. A choice of three types of payroll stationery is offered for payslip format. Details required to complete P45, P60, P35 and P11 forms are also available.

The payroll module includes the option to make alterations to records where operator errors are detected. Statutory Sick Pay is not catered for by this module, but Raindrop has an SSP module which can be used as a discrete module or linked to the Payroll. All functions necessary to administer the Government scheme are included in the module.

Electronics Aids Integrated Accounts System

The Integrated Accounts System from Electronics Aids incorporates a payroll program which is accessed from the pay menu. It caters for seven overtime rates defined by the user. There are two pre-tax adjustment rates and also two after-tax adjustment rates.

Deduction cards are in a similar style to the manual deduction sheets issued by the Inland Revenue. There is a choice of payroll run method; individual employee payroll run, or a full payroll run. A coin analysis is provided for cash payment. The program also provides a pay run cost analysis.

National Insurance, tax and Statutory Sick Pay can all be updated after any Budget changes, but only if there is no change to the tax system or to free pay tables.

Summaries of pay, tax and National Insurance are also available. The program does have a routine for deleting an employee who has left the company. The employee data must remain in the program until the end of the tax year, when it can be deleted and the vacant file used for another employee.

It is impossible to access the program without the correct password. This can be changed when required. A dongle is also provided.

Payroll Plus

Landsoft have two available payroll programs, Payroll Plus being the original program and less sophisticated than its big brother Payroll 2.

Written to Inland Revenue specifications for computerised payrolls, it covers all tax codes and all NI codes. Hourly, weekly and monthly paid staff can be mixed on the same file disk in any order.

Three rates of overtime are covered, either as a percentage of the basic hourly rate or as an amount. It offers five pre-tax and five after-tax adjustments, of which two of each can be pre-set to avoid the necessity of re-entering each payday.

Access to data for manipulation is under a security password or code which can be changed when required. All employee data is easy to change.

Four choices of payroll run are offered: payslip printed out after each entry; all entries made first and then a continuous print run, immediate payslip print run without entries; or selection of individual employees. Payslip and copy are produced side by side. Analysis after payrun is provided in each of up to 26 groups or departments, including the amount the employment has actually cost, total overtime, overall tax, NI, etc., and also a note and coin analysis.

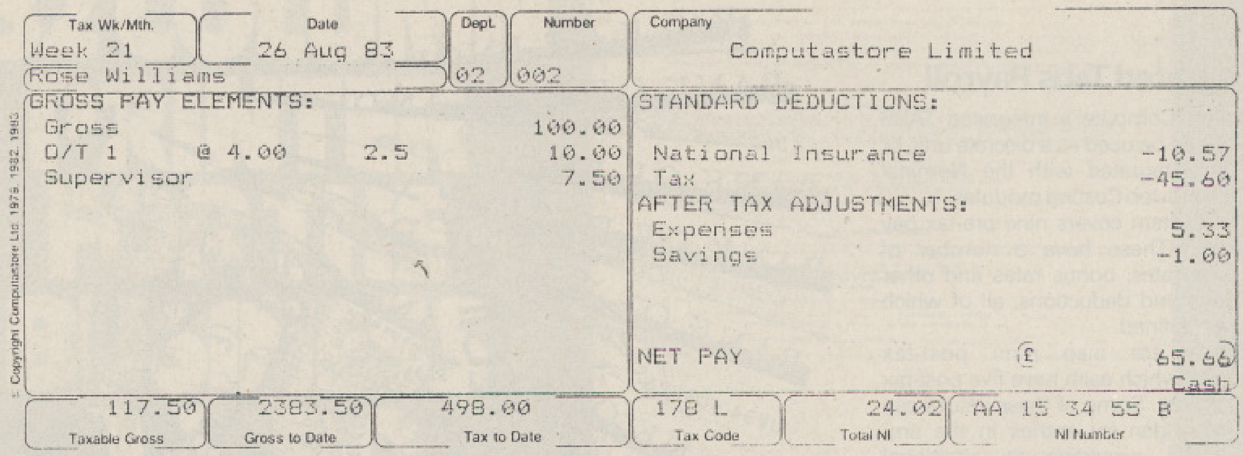
P35 listings can be provided. At the end of the year totals can be automatically zeroed ready for the new tax year.

Landsoft offers an Update Service at a cost of £25 plus VAT a year. Whenever legislation requires, an updated program disk is dispatched which also includes any program improvements that may have been introduced.

Big brother to Landsoft's Payroll Plus program, Payroll 2 offers extra features while retaining the simplicity of operation of the original program.

Again the program covers all tax codes and all NI table letters. Hourly, weekly and monthly paid staff are mixed on the same disk. Three rates of overtime can be set by the user.

Four of the five pre-tax adjustments (including SSP) can be pre-set, while all five after-tax adjustments can be pre-set if required. Tax code changes can be globally changed.



Tax Wk/Mth. Week 21
Date 26 Aug 83
Rose Williams
Dept. 02
Number 002
Company Computastore Limited

```
GROSS PAY ELEMENTS:
 Gross                                  100.00
 O/T 1        @ 4.00       2.5           10.00
 Supervisor                               7.50
```

```
STANDARD DEDUCTIONS:

 National Insurance                     -10.57
 Tax                                    -45.60
AFTER TAX ADJUSTMENTS:
 Expenses                                 5.33
 Savings                                 -1.00

NET PAY                        £          65.66
                                          Cash
```

Taxable Gross 117.50
Gross to Date 2383.50
Tax to Date 498.00
Tax Code 178 L
Total NI 24.02
NI Number AA 15 34 55 B

© Copyright Computastore Ltd 1978, 1982, 1983

Computastore's payslip lists each item which makes up an employee's wages.

SSP is calculated and printed on each payslip copy. The SSP paid total is held and overall totals for the year to date. Access to employee data is under a password and entry of data is to a very high degree of validation.

A choice of payroll run methods offers entries made and then continuous print out; immediate print run without entries; or the selection of individual employees. Payrun produces plain or pre-printed payslips.

Payrun analyses after each print run are provided in up to 26 different groups, which can be combined with other analyses to produce a final combined analysis.

Giro slips and cheques can be printed automatically, but if the user prefers to write cheques manually, the schedule makes the job easier.

P14, P60 and P35 listings are obtainable and at the end of the year grand totals and individual employee totals can be globally zeroed.

The system also incorporates an interrupt system whereby the computer can be used for other purposes before returning to the point of close down to continue entering. Landsoft's Update Service is also offered for Payroll 2.

Sky Software Multi-user Payroll

Sky Software, which has recently changed its name from Comsoft Associates, offers a multi-user management accounting package including a payroll program which can be operated on its own or as part of the package.

It is designed to make payroll runs as easy as possible, but provides facilities for complicated pay structures and full manual intervention if necessary.

There is no limit to the number of employees and up to 21 rates of pay and standard adjustments are covered, plus 12 occasional adjustments.

Weekly, four-weekly and monthly paid staff may be held on the same disk and sub-contract staff are catered for. Tax codes are easily updated and SSP is calculated. P60 and P45 information can be printed, and all prints may be restarted or reprinted.

Holiday pay and holiday stamp schemes are also catered for, as are any retention monies.

Correction of payment is allowed, with reports corrected for reprint after error correction. A control list is produced for checking payments before pay slips are printed.

Payment can be made by credit transfer, with a credit transfer list printed. Cheques can be printed and if paying in cash, the payroll provides a coin analysis.

A departmental analysis of costs can be produced and the whole system has password protection.

Pegasus Business Software Payroll

Pegasus Business Software's accounting system enters 1984 as one of the UK's top selling systems. It includes a payroll module which will operate alone or as part of a totally integrated accounting system.

With the Pegasus payroll system, the user designs his own payslip. It caters for up to 17 user-defined payment types and up to 17 deduction types, also user-defined. Statutory Sick Pay is catered for by this payroll system. If an employer pays staff by cash, a coin analysis is provided indicating the notes and coins required for each wage packet.

Payslips, Giros, cheques and employee's record cards may be printed at any time either for the whole file, a single employee, or a range of employees. End-of-year forms, P60's and P35's are all provided at the end of the year. Full departmental analyses are available and also an overall company analysis.

Up to 500 employees can be entered onto one disk. Employees may be removed from the file at any time, but their details will be retained until year end for statutory reports.

Pegasus' payroll module can be integrated with the nominal ledger and job costing. In this instance, any data entered onto the payroll program will automatically update related information in another module.

SPECTRUM PAYROLL 8000

Spectrum's Payroll 8000 system is part of a comprehensive accounting suite of software. It reflects all Statutory (SSP) and Bank (Giro) regulations.

Up to four pre-set payment amounts per employee are catered for, with up to five hourly rated entries per employee. Up to five pre-set standard deductions for each employee are available, plus an override for 'one-off' bonuses or deductions.

One data disk handles weekly, 2 weekly, 4 weekly and monthly payrolls.

The program automatically calculates PAYE and NI for employee and employer, for all different classification and codes. SSP is also calculated.

Pension contributions can be entered as either a fixed amount or calculated as a percentage of a gross pay or basic pay.

Holiday pay can be paid either for the entire payroll or to selected employees and holiday accruals can be accumulated by an employee as a percentage of a weeks gross pay or as a fixed amount.

Payment can be made by Cash, Bank Giro, Cheque or a mixture of the three. Individual and overall coin analysis is available for cash payment. Payslips, Bank Giro and Giro Schedules, Cheques and statutory Year End Forms are all produced automatically.

Departmental analysis for an overall analysis is also automatically produced. Access to the program is limited to authorised personnel.

SPECIMEN
FIVE POUNDS
The Duke of Wellington 1769 · 1852

Payroll Master

M & M Software is to launch a payroll package very shortly, called the Payroll Master. Four versions of this package will be available – V1 with a 600 file capacity and V2 with a 1800 file capacity, both of which feature manual SSP calculations; V3 with a 140 file capacity and V4 with a 500 file capacity, both featuring automatic SSP calculations.

Designed and written to comply with Inland Revenue Specifications, Payroll Master caters for all Tax Codes and NI codes (including contracted-out). Hourly, weekly and monthly paid staff can feature on the same disk.

There are three overtime rates of pay, and four pre-tax and after-tax adjustments which may be pre-set. SSP is calculated automatically.

Payroll Master provides individual and total cash analysis and cost analysis for up to 26 groups or departments.

Contractors Payroll System

FCG Computer Systems offers a payroll system designed with building contractors in mind. It operates around conventional timesheets, with time worked for each employee entered and labour costs posted to the contract cost ledger.

The system is set up in accordance with National Working Rules to automatically calculate overtime pay, sick pay, travel money, fares allowances, HWP stamp allocation and proportion of GMB. However it does accommodate variations from the NWR.

Individual sub-contractor records contain the expiry date of the C714 certificate and calculate tax at zero or 30% as appropriate. Reminders are produced three weeks in advance of expiry.

There are 26 pay elements, 10 of which can be user-defined, such as pension and court orders. PAYE is calculated and payslips are printed with a complete analysis of the pay make-up. A coin analysis is provided and also a payslip analysis summarising all payslip entries.

For each payroll run, a contract cost analysis shows cumulative and current week costs and hours worked for each trade on each contract. An employee contract analysis lists the time spent by each employee on each contract, plus the resultant cost of his labour.

At the end of the year P35 and P60's are printed out and end of year totals are automatically zeroed (pay, tax, NI, etc). Any updates in rate of pay or tax codes are globally updated.

Weekly payrun totals are printed and also the current and past months Tax and NI deductions detailing both gross (including SSP) and nett NI figures (useful for PAYE payments).

Statutory changes in Tax and NI are under user control. Instructions and data are forwarded to each user if required. Any record on file can be viewed, altered, deleted, or printed out at any time. Password protection is available if required.

Bonus

Intex Datalog's Bonus payroll system is menu-driven. Weekly, multi-weekly and monthly paid staff are all on one disk. The payroll can be for one, a range or all employees. Calculations can be reversed and the payroll re-run for selected employees.

SSP is calculated and an extra SSP module determines eligibility and calculates sick pay even in complicated cases. When tax codes change, the relevant data has to be entered just once and each employee's code number is automatically amended.

Changes in tax rates necessitate changes in the program itself. When changes are due, Intex Datalog provide a program which automatically updates the payroll disk. Holidays are payable in advance either by allocation of hours or accrual.

BONUS has 20 company additions/deductions before/after tax – 10 per employee. These can be standard if required. Eleven overtime rates can be catered for, five per employee. It also has a piece-work facility. Pay rounding and cash analysis is optional and Giro and cheques can be printed.

Monthly and year-end summaries are provided and end-of-year forms are printed out. Departmental analyses are also provided. BONUS Print formats can be designed by the year. has a two-level password protection and the program will not operate without a security key being fitted to the computer.

Product survey data

Product: Spectrum Payroll 8000
Manufacturer/Supplier Spectrum Business Services, PO Box 199, Spectrum House, 27 East Parade, Bradford, West Yorkshire BD1 15R. Telephone 0274 308188.
Price: £300
Comments: Available on diskette as part of accounting suite.

Product: Payroll Master
Manufacturer/Supplier: M & M Software, Wych Elm House, The High, Harlow, Essex. Telephone 0279 39576
Price: £150-300 depending on version required
Comments: Separate program on diskette

Product: BONUS
Manufacturer/Supplier: Intex Datalog, Eaglescliffe Industrial Estate, Stockton-on-Tees, Cleveland TS16 0PN. Telephone 0642 781193
Price: £400 plus VAT
Comments: Separate program on diskette

Product: FCG Contractors Payroll
Manufacturer/Supplier: FCG Computer Systems, Hamilton House, Mabledon Place, London WC1H 9BD. Telephone 01-388 7345
Price: £1100
Comments: Separate hard disk program. Diskette version also available

Product: Payroll Plus
Manufacturer/Supplier: Landsoft, 28 Sheen Lane, London SW14 8LW. Telephone 01-878 7044
Price: £150 plus VAT
Comments: Separate program on diskette

Product: Payroll 2
Manufacturer/Supplier: Landsoft, 28 Sheen Lane, London SW14 8LW. Telephone 01-878 7044
Price: £375 plus VAT
Comments: Separate program on diskette

Product: Multi-user Payroll
Manufacturer/Supplier: Sky Software, 13 New Road, Bromsgrove, Worcestershire B60 2JG. Telephone 0527 36299
Price: £350 for payroll program, £500 for multi-user package
Comments: Separate program or part of package on hard disk

Product: Pegasus Business Software Payroll
Manufacturer/Supplier: Pegasus Business Software, 20/22 Station Road, Kettering, Northants. Telephone 0536 522822
Price: approximately £350 per module
Comments: Separate module or part of accounting suite on hard disk

Product: Integrated TABS Payroll
Manufacturer/Supplier: Raindrop Computers, 46 Cadogan Lane, London SW1. Telephone 01-235 6286
Price:.£250
Comments: Separate module, or integrated into accounting package, on diskette

Product: Integrated Accounts System
Manufacturer/Supplier: Electronics Aids, Mythe Crest, The Mythe, Tewkesbury, Gloucestershire GL20 6EB. Telephone 0684 294003
Price: £400 plus VAT
Comments: Part of accounts package on diskette

Product: Officemate
Manufacturer/Supplier: Micro Computer Centre, 28 Sheen Lane, London SW14. Telephone 01-878 7044
Price: £325 plus VAT
Comments: Payroll module on diskette

Product: Superpay
Manufacturer/Supplier: Computastore, 16 John Dalton Street, Manchester M2 6HG. Telephone 061 832 4761
Price: £395 plus VAT.
Comments: Separate program on diskette

BOOKKEEPING
FOR THE
CASH TRADER
ON THE
CBM
64

- **Purchase day book**
- **Weekly takings summary**
- **VAT Account (Retailer schemes A & B)**
- **Trading Account**
- **Profit & Loss Account**
- **Balance Sheet**

FREE 14 DAY TRIAL OFFER

Send us a cheque for £25.00 as a deposit, and we will send you a demonstration cassette or disk, the user guide and specimen reports on 14 days trial.

If you then wish to buy the live system, return the demonstration cassette or disk (keep the user guide) and a cheque for the balance of £64-70 and we will send you the live cassette or disk and our VAT invoice.

Alternatively, if you return to us the cassette or disk, the specimen reports and the user guide in good clean condition, we shall return £20.00 to you retaining £5.00 to cover our handling charges.

Receipt by us of your cheque for the £25.00 deposit will signify your agreement with these conditions. Please state whether you require cassette or disk.

PRICE £78.00 + VAT

QUICKCOUNT LTD
15 NEELD CRESCENT
LONDON NW4
01-202 5486

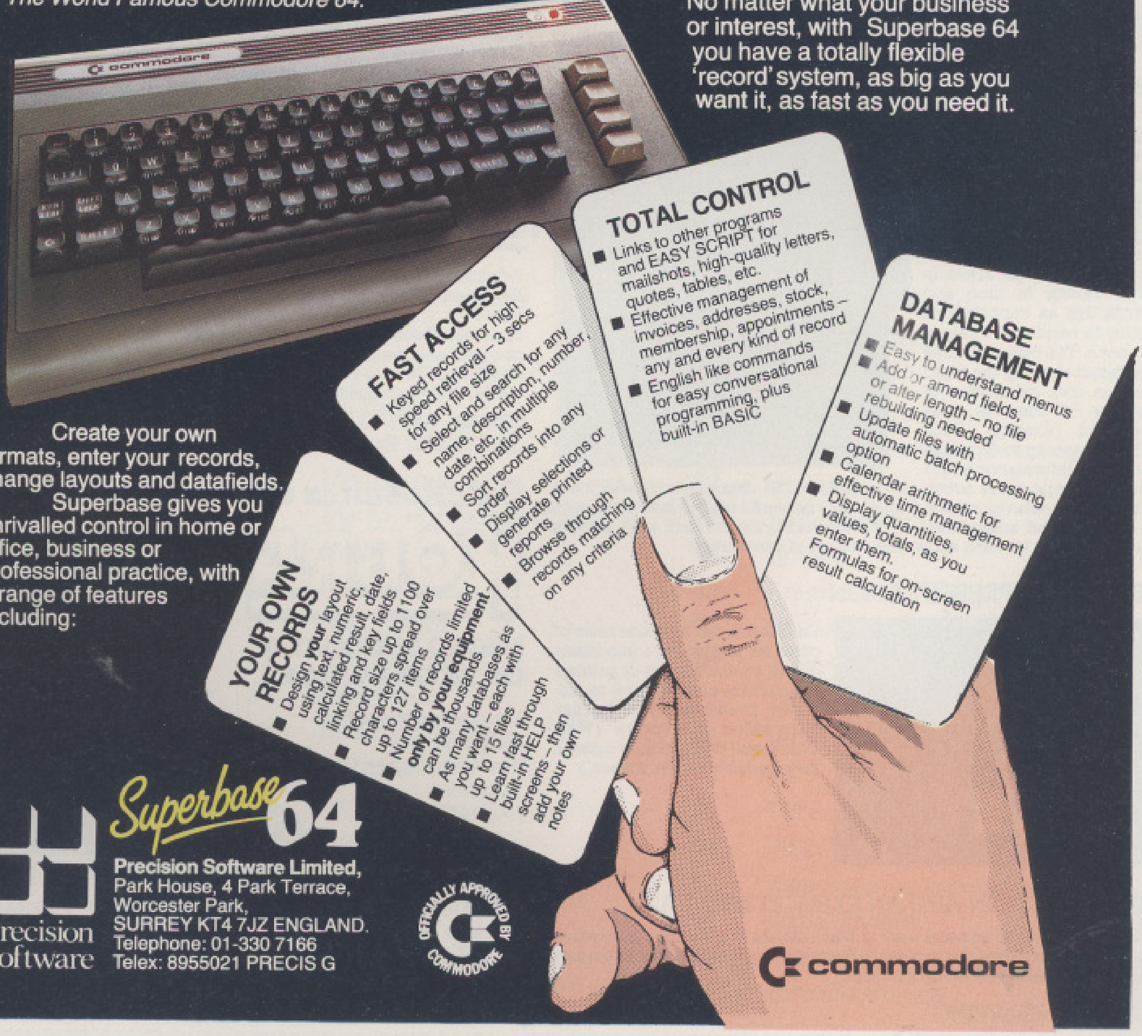
Strengthen your hand with *Superbase* 64

The complete information control system for the Commodore 64.

The World Famous Commodore 64.

No matter what your business or interest, with Superbase 64 you have a totally flexible 'record' system, as big as you want it, as fast as you need it.

Create your own formats, enter your records, change layouts and datafields. Superbase gives you unrivalled control in home or office, business or professional practice, with a range of features including:



YOUR OWN RECORDS
- Design **your** layout using text, numeric, calculated result, date, linking and key fields
- Record size up to 1100 characters spread over up to 127 items
- Number of records limited **only by your equipment** – can be thousands
- As many databases as you want – each with up to 15 files
- Learn fast through built-in HELP screens – then add your own notes

FAST ACCESS
- Keyed records for high speed retrieval – 3 secs for any file size
- Select and search for any name, description, number, date, etc. in multiple combinations
- Sort records into any order
- Display selections or generate printed reports
- Browse through records matching on any criteria

TOTAL CONTROL
- Links to other programs and EASY SCRIPT for mailshots, high-quality letters, quotes, tables, etc.
- Effective management of invoices, addresses, stock, membership, appointments – any and every kind of record
- English like commands for easy conversational programming, plus built-in BASIC

DATABASE MANAGEMENT
- Easy to understand menus
- Add or amend fields, or alter length – no file rebuilding needed
- Update files with automatic batch processing option
- Calendar arithmetic for effective time management
- Display quantities, values, totals, as you enter them. Formulas for on-screen result calculation

Superbase 64

Precision Software

Precision Software Limited,
Park House, 4 Park Terrace,
Worcester Park,
SURREY KT4 7JZ ENGLAND.
Telephone: 01-330 7166
Telex: 8955021 PRECIS G

OFFICIALLY APPROVED BY COMMODORE

commodore

Simplify all your work with numbers -

CalcResult™

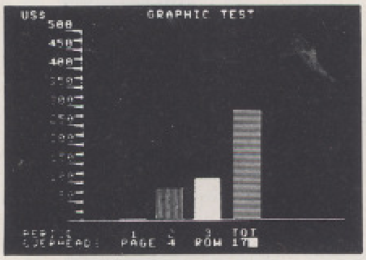
The 3 dimensional program that's a hit with users all over the world!

Only CalcResult gives you all these exciting features . . .

● THREE DIMENSIONAL CALCULATION

CalcResult's powerful three dimensional spread sheet format rapidly becomes an irreplaceable tool for those involved in figure manipulation and relationship. Budgets reports, statements, forecasts and planning are all areas in which a saving in time and resources are as important as the ability to handle all forms of calculations. The many features of CalcResult simplify the rapid production and calculation of all aspects of business forecasting and planning. Each model can have up to 32 pages of associated information with a consolidated report and every page has 63 × 254 data positions which can contain text, formulas or values. CalcResult's powerful editing functions mean rapid creation and amendment of models and, once created, split screens and multiple page viewing allow easy review of information.

● GRAPHIC REPRESENTATION



CalcResult can translate rows of columns of numbers into histograms on the screen or printed histograms can be used to enhance presentation of tabular information in reports. (With CalcResult 64 full colour options are available on the screen.)

● HELP FUNCTION AND AN EXPLICIT MANUAL

CalcResult is simple to use and easy to learn thanks to a detailed instruction manual and help screens that are available at the touch of a button, to explain the functions available for each command.

● FLEXIBLE PRINTING

CalcResult allows you to define your own report layout. You can choose the order of columns to be printed and set the width of each independently. Layout definitions can be stored on a disk for future use.

● TIME SAVING COMMANDS AND CONDITIONAL FUNCTIONS

Commands like replicate, copy, move, go to, insert and delete make CalcResult simple and easy to use. CalcResult calculates according to correct mathematical priority and has standard functions for statistics, trigonometry and logarithms. Conditional functions like IF THEN ELSE and OR AND NOT allow greater flexibility in the setting up of models. Once created, all formulas are protected from accidental deletion.

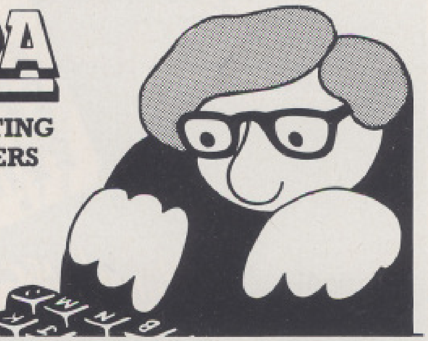
CalcResult is available for the business and home user . . .

Advanced CalcResult, with the three dimensional capability, is available for the Commodore 700, 8000 and 64 computers—with a disk drive. A special home or small business version, Easy CalcResult 64, is available as a cartridge. Because this does not require a disk drive the three dimensional, graphic and help function features are not available but even so Easy CalcResult 64 is as powerful as the traditional spread sheets previously only available on expensive business micro computers.

PRICES: EASY CALCRESULT 64 £69 ADVANCED CALCRESULT 64 £109
CALCRESULT 8000 £199 CALCRESULT 700 £225 ALL PRICES PLUS VAT

CalcResult is only available from

KOBRA



MICRO MARKETING OR THEIR DEALERS

Kobra Micro Marketing,
P.O. Box 28,
Henley-on-Thames, Oxon.
Telephone
(0491) 572512

SEND IN THIS COUPON NOW FOR DETAILS

To: Kobra Micro Marketing, P.O. Box 28, Henley-on-Thames, Oxon.

Please send details of the exciting CalcResult program. I am interested in:

CalcResult 700 ☐ CalcResult 8000 ☐
CalcResult 64 ☐ Easy CalcResult 64 ☐

Name ____________________

Address ____________________

____________________ Tel. No. ____________________

COMMODORE
COMPUTING INTERNATIONAL

SUBSCRIPTION ORDER FORM

Please send me 12 issues of *Commodore Computing*

CHEQUE ENCLOSED ☐

PLEASE DEBIT MY ACCESS ☐

AMERICAN EXPRESS ☐

BARCLAYCARD ☐

CHARGE NO. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiry date:

Cheques should be made payable to:
Commodore Computing

TO AVOID FUTURE LAPSE IN MY SUBSCRIPTION PLEASE DEBIT MY RENEWAL FEE TO MY CREDIT CARD ANNUALLY UNTIL I CANCEL IN WRITING.

Name..

Address..

....

County .... Post Code ....

Telephone (home)..

(Business) ....

Signed..

Date (Sub to commence) ....

☐ Subscription rate U.K. £15.00
☐ Europe £20.00
☐ Outside Europe £28.50

Return form to:
Subscriptions Manager,
Commodore Computing International
167-169 Great Portland Street,
London, W1

ADVERTISERS DIRECTORY

MARCH 1984

Adman Electronics	66
Anger Productions	46
AR Softward	52
Atari	24
Audio Computers	2
Beaver Software	66
Bubble Bus	13
Bytewell	36
Calco	20, 44, 50
Car Fleet Controls	52
CBM	8
Computerama 64	31
Cyber Robotics	20
Dataplus	73
Electronic Aides	48
Elmhurst Instruments	50
Galactic Software	95
Games Machine	26
Greenwich Instruments	45
ICPUG	55
Impulse Computer	48
JCL Software	67
Kobra Micromarketing	88
Landsoft	76
Level 9	14
Mannesman Tally	82
Marketing Micro Software	71
MDM	46
Microport	48
Micropower	50
Microsimpex	34
Mirrorsoft	7
Mr Chip Software	65
Nationwide	14
Oxford Computer Centre	36
Phoenix Publishing	44
Precision Software	87
Quickcount	86
Ram Electronic	29
Romik Software	96
Scientific Software	50
Simple Software	48
SIP	45
SM Software	15
Small Systems Engineering	45, 68
Softalk	32
Softchoice Ltd	29
Softex	46
Southcott Software	66
Starcade	12
Supersoft	74
Tandata	13
Terminal Software	10
3D	20
TM Software	76
VIC20 Software Library	46
Video Games International	4
Viza Software	62
Vulcan Electronics	52
Zero Electronics	67

Commodore's PET

The cost of re-equipping a research laboratory with the latest microprocessor-controlled instrumentation can be astronomical, and, in the University sector at any rate, the necessary finance is not available. However, many older pieces of apparatus can be given a new lease of life by using them with a dedicated on-line microcomputer. Many of the advantages and facilities of a new instrument may, in this way, be obtained at a fraction of the cost. In this article Dr Alan Collins describes some of the areas of research in which Commodore computers are being used in the physics department at King's College London.

The physics research department at King's College London has used Commodore computers to control instruments, and collect and process data, since the PET 2001-8 was first introduced in 1978. This early PET was the first self-contained modestly-priced microcomputer on the British market that gave the user access to the address and data buses.

Two research students at King's College – Ricardo Rodrigues and Peter Siddons (now both PhD's) – developed a memory-mapped interface for the PET 2001, containing two 6522 VIA's and up to 3K of EPROM, which was located in the block 9 address space (see Journal of Physics E (1979), Vol. 12, pp.403-408). This interface, which is also suitable for the CBM 3000 and 4000 series computers, is configured to provide a 16 bit data bus, an 8 bit control bus and an input and output handshake line.

This permits operating up to 256 different data-handling modules, each capable of working to 16-bit precision. Typical modules are 3, 4 and 8 phase stepper motor drives, 16-bit counter, 12-bit analogue to digital convertor (ADC) and digital to analogue convertor (DAC), mains-synchronised clock and various electro-mechanical devices. Machine-code routines to handle the input and output functions are contained in the on-board EPROM and are selected by a series of USR calls.

Similar hardware, driven from the IEEE port, is now available commercially, but the early impetus given by the Rodrigues-Siddons interface has resulted in five different research groups in the department using Commodore computers to run experiments and process the data.

Machines from the 2000/3000, 4000, 8000 and 9000 series are currently in operation. Some systems still use the original interface while others input and output data via the IEEE bus (GPIB).

A Bus Operating System (BOS) has been developed which allows any apparatus with an IEEE port to be successfully interfaced to the computer and which greatly speeds up data transfers to and from GPIB instruments such as the Commodore disk drive. (For example a 4000 point integer array can be written on the disk in less than seven seconds).

For many applications the processing power of the Commodore machine is adequate, but when substantial "number crunching" is required data files are sent to a PDP 11/44 – and from there to the University of London Computer Centre if necessary. The RS232 link to the PDP 11/44 uses either a NETKIT in the CBM, or the built-in ACIA in a 9000 series PET, driven by our own file-transfer program which uses a check-sum to ensure there are no errors. Alternatively data can be transmitted using a Small Systems Engineering IEEE to RS232 convertor.

Experiments

In almost every experiment the results are finally summarised as a "spectrum" or graph in which one variable is plotted against another. The related variables may be X-ray intensity and angle, transmission and wavelength, electron energy and voltage, signal amplitude and time, and so on. Brief details of the way the microcomputers are used in these investigations are given below.

X-ray diffraction

When a suitably cut crystal is placed in a narrow beam of X-rays, the X-rays are diffracted in directions which depend on the structure of the crystal, the wavelength of the X-rays and the angle between the crystal and the incident beam. In a simple experiment the crystal is mounted on a platform which can be rotated by a stepper motor and the diffracted X-ray beam is detected by a stationary geiger counter.

The number of counts from the geiger counter, recorded in a fixed time interval, will depend on the angle between the crystal and the X-ray beam. The experiment can be completely automated by registering the pulses from the geiger tube on a 16-bit counter and driving the stepper motor, both by means of the interface described earlier.

After a fixed time interval controlled by the computer the reading from the counter is transferred to memory, the counter is reset to zero, pulses are fed to the stepper motor to rotate the crystal slightly and the sequence restarted. At the end of the experiment the array of numbers stored in the computer can be processed to show a graph of diffracted X-ray intensity as a function of angle. Hard-copy is produced on a Hewlett-Packard plotter connected to the IEEE port.

Silicon

More sophisticated X-ray diffraction studies use single crystals of silicon which act as X-ray interferometers. Some of these crystals must be cut to very elaborate shapes. This is carried out by moving the sample in three perpendicular directions using a micropositioner fitted with three stepper

APPLICATIONS

– fit for King's

motors driven by the computer, and grinding the silicon away with a dental drill. Many samples of great complexity can be reliably and reproducibly fabricated by this technique.

Optical absorption

A great deal can be learned about processes in crystals from the wavelengths at which the material absorbs light. For wavelengths to which the eye is sensitive this absorption affects the colour observed, but important information is also obtained from studies in the ultraviolet and infrared regions.

A spectrum can be produced by using a monochromator in which the incoming light is split up into different wavelengths with a diffraction grating. When the grating is rotated, the different wavelengths fall in turn on a detector which produces an analogue signal proportional to the intensity of the light at that wavelength.

For computer operation the signal from the detector is read by a 12-bit ADC and the grating is either rotated by a stepper motor driven from the interface, or by a synchronomous motor, in which case data transfers are timed with the mains-synchronised clock. The first method allows repetitive scanning to be carried out which is useful in some applications.

Initially an incident-light spectrum is recorded with no sample present and the 3000 to 4000 12-bit numbers are stored in memory. After inserting the sample the transmission spectrum is recorded over the same wavelength range. At each point the absorbance is calculated by taking the LOG of the ratio of the two spectra and, after scaling, is plotted against wavelength on an X-Y plotter, using a two-channel 12-bit DAC.

Software for the plotter, including a vector generator and generation of a limited number of symbols, is contained in an EPROM. The final spectrum can be stored in a few seconds on floppy disk, for future reference.

The use of the Commodore 3000 in this application has greatly speeded up what used to be a tedious manual analysis of analogue chart recorder output, and many hundreds of spectra have been obtained in this way.

Fourier-transform spectroscopy

Another method used to obtain optical absorption spectra, particularly in the infrared spectral region, uses an interferometer rather than a monochromator. In the interferometer the incoming light is split into two beams, then these two beams are recombined at the detector, using a system of mirrors.

When one of the mirrors in one beam is moved at a slow steady rate, in a direction perpendicular to the beam, the signal from the detector, plotted against time, is a series of fringes. The absorption spectrum can be calculated from this fringe pattern using a mathematical technique known as Fourier transformation.

Using a commercially available ROM (from Structured Software) which carries out a fast Fourier transform (FFT), absorption spectra can now be obtained, plotted out on a Commodore printer, in a few minutes. As in other applications the analogue signal from the detector is sampled using a 12-bit ADC, and between each reading the mirror is moved using a stepper motor driving a precision lead screw.

This on-line analysis has completely replaced the earlier procedure in which data on punched paper tape was processed by the University of London Computer Centre.

Radio wave propagation

The FFT technique is also used in a CBM-controlled system dedicated to an analysis of "atmospherics". For a short-wave listener atmospherics are the annoying clicks and crackles which interfere with the station of interest. However, from a Fourier analysis of the waveform of an atmospheric, which shows how the signal varies with frequency, a great deal can be learned about the electrically active layers in the Earth's ionosphere, and how these influence the propagation of radio waves. (Without these layers, long distance radio communication would not be possible).

To carry out the analysis three signals derived from the atmospheric are digitized and stored in a three channel × 1024 word Datalab Transient Recorder. These data are then transferred to the CBM and, after preliminary signal processing, waveforms are sent to a Hewlett-Packard spectrum analyser which obtains spectra using a hard-wired FFT.

These spectra are returned to the CBM for final processing, and parameters calculated are output to a CBM printer, a Christie digital cassette and a CBM disk drive. All data transfers are via the GPIB.

Photo-electron spectroscopy

When a gas molecule is illuminated with very short wavelength ultraviolet light it may be ionized, giving out an electron. The energy of this electron is well defined and is characteristic of the molecule being investigated.

To measure the electron energy the electron is made to follow a curved path between two curved metal plates which have a voltage difference between them. If the voltage between the deflector plates is correct the electron will reach a detector. This is an electron multiplier (or channeltron), and after amplification the signal from the channeltron is converted into an analogue voltage proportional to the number of electrons collected per second.

In the spectrometer controlled by a PET this analogue voltage is digitized by a CIL microsystems PUPI interface. The interface also generates the scan voltage for the spectrometer deflector plates, and the digitized photoelectron signal is stored at fixed intervals of the scan voltage. At the end of the scan the energy of the electron can easily be determined from the array of stored data.

The computer-controlled digitally-generated scan voltage is very much more flexible than the electronically-derived ramps used previously, and the storage of the spectra on disk allows the data to be processed in more detail after the experiments have been completed.

In conclusion, Commodore computers are used to control experiments and collect and analyse data in the physics research department at King's College London. The computers either use an interface designed here, or commercial interfaces or other equipment connected to the IEEE port. These dedicated on-line computers have greatly increased the speed and convenience with which our results can be obtained.

CLASSIFIED

SOPHISTICATED GAMES FOR VIC 20

VIC CRICKET Realistic game of skill and luck with all the major rules of cricket correctly interpreted. Ball by ball commentary, full scorecard, printer and game save facilities. Needs 16K expansion. £5.99*

LEAGUE SOCCER League championship game for 2-22 players/teams. Automatic fixtures, full action commentaries, match facts. League tables, results check, postponed games etc. Non league matches also playable – the VIC will even make the cup draw. Printer and game save. Needs 16K expansion. £5.99*

WHODUNNIT? Twelve guests have gathered for drinks at Murder Manor. However, one of them has more than drinks on his mind. Thrilling detective game for 1-6 players, with genuinely different murder every time. You can even rename the suspects! Needs 8K expansion. £4.99*

ELECTION NIGHT SPECIAL For 1 to 3 players: and you are the leader of a political party and your task is to win the election and become Prime Minister. Features constituency visits, opinion polls, holds, gains, etc. Printer and game save. Needs 8K expansion. £4.99*

TOP OF THE POPS Money making game about the music business. Make your own records and see them climb the chart. Printer and game save facilities. Needs 8K expansion. £4.99*

VIC PARTY 4 Contains MASTERWORD, A DAY AT THE RACES, GAME (Strip Poker), and CONSEQUENCES. Four games ranging from the serious to the ridiculous. All good fun – nothing offensive. Needs at least 3K expansion. £5.99*

Available from:
SOPHISTICATED GAMES, Dept CCI, 27 Queens Road, Keynsham, Avon, BS18 2NQ. Tel 02756 3427 or write for further details of our complete range.

*P&P free (UK only). All games sold subject to our conditions of sale, which are available on request.

VETS FOR PETS

Anita Electronic Services (London) Ltd. are specialists in the repair and service of Commodore Pets, Commodore 64s and Vic 20s, and associated printers including Commodore, Centronic, Anadex, NEC, QUME, Rioch and Epson. We offer a fast on-site service or alternatively repairs can be carried out at our workshops should you wish to bring in your machine.

Maintenance contracts are available at very competitive prices. Trade enquiries welcome.

For further information, telephone or write to:

MR. D. WILKINSON
Anita Electronic Services Ltd.,
15 Clerkenwell Close,
London EC1
01-253 2444

COMMODORE SOFTWARE

TAROT – See into the future! Ask any question and the Tarot will answer! Full graphics.
CBM 64 and **VIC 20 + 16K** cassette **£4.00**

SIMULATION – Mathematical model that includes graphic evaluation. Invaluable decision aid.
VIC 20 (any size) cassette **£3.50**

DATA FILE – Takes the place of any card index. Facilities include:– save, load file, full sort, print all/part records, amend, delete records memory remaining etc.
VIC 20 (+ 8K min.) cassette **£4.50**

TEXTPRO – Powerful word processor. Facilities include:– Large text buffer, auto centre text, variable tab, insert, amend, delete, copy, move text, word count, right justify, etc. Fully menu driven with comprehensive easy to use instructions. Great value.
VIC 20 + 16K cassette **£6.95**
VIC 20 + 16K **disk £9.45**

DATAPRO – A database with very powerful options. Includes:– print all/selective records, delete, amend, save, load, copy, alphanumeric sort, user defined fields, memory check, total numeric fields, multi field interrelational, wildcard and search between limits. Multiple file option, and many more. Fully menu driven with complete instructions. Disk and cassette fully compiled. Outstanding value.
CBM 64 (compiled) cassette **£7.45**
CBM 64 (compiled) disk **£10.25**

All programs complete with full documentation and guarantee. Prices include VAT. Packing and fast delivery by 1st class mail.

Cheque/PO to:–
A & C SOFTWARE
51, Ashtree Rd., Tividale,
West Midlands. B69 2HD.

Dealer enquiries welcome

MULTI Q ANALYSIS

A utility for the Commodore 64

IDEAL: Home Accounts/small trader

ANALYSIS: total and 40 accounts – up to 400 items with own narrative.

MONITOR: bank/building society accounts, cash, or home budget by using this cash/ledger analysis.

FEATURES: password; disciplined data files with carry forward; dedicated transaction numbering; multiple analysis of transactions if required (eg for VAT); simple input (not debits/credits) therefore easy to use.

PRICE: cassette £14.70

s.a.e. details

QUIPUS COMPUTING
PO Box 428 London SE19 3XT

WORDPOWER

(It's nearly famous)

A new machine code wordprocessing program for the CBM PET – £40, inc Manual & P+P

Reviewed in Commodore Computing, May '83

Send A4 SAE for further details.
(Manual Available Separately £1)

To: Mr K Pretorius,
15 The Vineries, Oakwood,
LONDON N14 4BH.

AUTO ESTIMATE

An estimating programme designed for the small printer or large.
Tailored to your company - contains all costs and charges which can be adjusted when you require - Will produce a quotation or an invoice complete with VAT. Quick and simple to use. —— **DISK £475.00**

ROUNDMASTER

Will print out showing Round persons name, Road name, Number of houses in road. Also will show total no. houses on round and payment rates.
Tailored to your company —**DISK £350.00**

Full details and sample print out will be sent on request. Contact: Ron Norman

MIKRON SOFTWARE
COMPUTER PROGRAMME DESIGNERS
109 King Street, Walton, Felixstowe,
Suffolk IP11 9DY Tel: 0394 282684

MAIL ORDER COMMODORE

VIC 20 3K	£ 89.00
COMMODORE 64	£178.00
VIC 20 STARTER PACK, vic 20 3k + cassette unit + intro to basic + 4 programs.	£125.00
C2N CASSETTE UNIT	£ 38.00
VIC 1520 PRINTER/PLOTTER	£127.00
VIC 1701 14in COLOUR MONITOR FOR 64.	£179.00
VIC 1526 DOT MATRIX PRINTER 60 CPS.	£263.00
VIC 1541 SINGLE DISK DRIVE + FREE PROGRAMS	£178.00

POST/PACKING & INSURANCE £8.00 PER ITEM.
FREE PRICE LIST AND CATALOGUE OF ALL MAKES TO

LEIGH GRAHAM COMPUTERS,
Lloyds Bank Chambers.
841 High Road, NORTH FINCHLEY.
LONDON N12 8PT

CLASSIFIED

COMMODORE 64
AND
VIC 20 PROGRAM COPIERS

They copy most cassette based BASIC, machine code and multi-part programs of any size. Both copiers are written in machine code. Programs using a range of protection techniques can be copied easily. Audio and visual prompts are used for easy operation. Full instructions are contained in the programs.

VIC IMITATOR £6
IMITATOR 64 £6

Please state which is required and make cheques/P.O.s payable to IAN WAITE.

Send orders to:
IAN WAITE, DEPT CI,
11 HAZLEBARROW ROAD,
SHEFFIELD, S8 8AU.

MICROCOMPUTER

REPAIRS SERVICES

VERY FAST

VIC 20, CBM 64,
PETS, SPECTRUMS
– COMMODORE COMPUTERS,
PRINTERS, FLOPPY DISKS
Phone SLOUGH (0753) 48785
MONDAY TO SATURDAY

FIELD SERVICE
25 MILE RADIUS
OF SLOUGH

EDUCATIONAL SOFTWARE

FOR THE

VIC 20 £4.95 EACH

Physics ('O' level/CSE revision)
Biology ('O' level/CSE revision)
Computer Studies ('O' Level/CSE revision)
Maths (CSE revision)
Arithmetic (practice 7/10 yrs)
Mathematics (practice 8/11 yrs)
Reasoning (11+ revision)
Knowledge (Quiz 9/99 yrs)

On Cassette Cheques/PO to

Micro-De-Bug
Consultancy
60 Sir Johns Rd, Selly Park
Birmingham B29 7ER
021-472 7610

CBM-64
MACHINE CODE MONITOR
20 commands including assembler, disassembler, load, save, verify (from tape or disk), relocate, single step execution and many more – an invaluable tool for the serious user.

CARTRIDGE ONLY	**–£29.95**

BASIC TOOL KIT
A range of useful basic commands e.g. Auto, renumber (including goto's, gosub's, etc.), delete, help etc.

CARTRIDGE – £24.95	
	CASSETTE – £16.95

PRINTER INTERFACE
Allows connection of Centronics type parallel printers to your CBM-64 (includes CBM control code conversion). Included in both Monitor & Toolkit.

CASSETTE	**–£ 7.95**

MONITOR & TOOLKIT

CARTRIDGE ONLY	**–£44.95**

SAE for details & orders to:
APOLLO COMPUTER SYSTEMS, P.O. Box 32, Dunsfold, Godalming, Surrey. GU8 4NE.

TECHNICAL SUPPORT MANAGER

Longman Group is a leading British publisher and is active in publishing software packages for school, home and professional uses. Longman is looking to strengthen its creative team for home learning software by the addition of a Technical Support Manager.

The requirement is for a good working knowledge of 6502 Assembly language (a working knowledge also of Z80 is desirable but not essential). Previous experience of working on computer software in publishing or education will be a considerable advantage. The person selected will work as part of a team both designing and commissioning entertaining software for learning purposes and will require a creative and entrepreneurial outlook.

Please write enclosing a full curriculum vitae together with salary expectation to:-

Mrs. Sally Ingle, Personnel Manager, Longman Group, Longman House, Burnt Mill, Harlow, Essex CM20 2JE.

Longman

VIC-20 & CBM 64

VIC-20
SCREEN
– TAKES 513 Bytes, GIVES 1020 poke locations. Yes, it DOUBLES screen size! Adds a new dimension to your arcade games. Please state memory size.

SWOOSH
– Can you fly a hang-glider? Well find out. Ride the thermals to complete your mission. A complex and challenging game. Astounding graphics & enlarged screen. (3K expansion & Joystick).

VIC-20 & CBM 64
CYBER
– Fancy a challenge? Then try this. Six levels of play. Can you capture ALL the aliens at once? Enlarged screen & multi-colour graphics. (3K expansion VIC-20).

All programs only £5.00 each from:

B2
3 GREENFIELD HOUSE,
GREENFIELD ROAD,
COLNE, LANCS. BB8 9PE

CLASSIFIED

COMMODORE 64 SYNTHESISER

Amaze your family, friends by playing a Piano, Banjo, Flute, Drum, Saxophone, PLUS any other 11 instruments (TOTAL 16).

NOW AVAILABLE FOR CBM 64

Only **£8.99** *(VAT P&P inclusive)*

Please send P.O./cheque to:

TUCRONICS

381 Leeds Road, Bradford BD3 9LY
West Yorkshire, England.

SOFTWARE LOW PRICES

All the Top UK Names plus USA Imports

Send SAE for pricelist (please state machine)

To:- **Soft-Cellar** 57 Fotheringay Gardens, Slough, Berks. SL1 5SP

PET 2001 32K. New Rom OK except for string handling fault. Suit experimenter. £75. David 01-954 6728.

"SYNSISOR" Program on cassette converts your Commodore 64 into a music synthesiser. Extremely simple to play, well over 10,000 different sounds possible! 10 octaves of playability! Record up to 2,000 notes then play them back and vary the speed. Highly responsive – even uses sprite graphics – what more can you ask? Only £5 from John Goldie "Coniston" 48 Rotchell Park, Dunfries, Scotland DG2 7RJ.

MORSE TUTOR CASSETTE Commodore 64. Variable sending speeds. Text or random. £4.99. inc P+P. Cheques/PO's payable to: **Doublesoft, Double Lodge, 49 Nags Head Lane, Brentwood, Essex. CM14 5NL. Tel: 0277 231569**

PET 2001 replacement 6550 RAM Chips normally £15, Bargain £6! 0742 483587

JUNIOR MATHS For Commodore 64 ideal tutor for addition, subtraction and tables. £3.99 inc. p&p. PO's/Cheques to:- Doublesoft,. 49 Nags Head Lane, Brentwood CH14 5NL. Tel: 0277 231569.

PET 16K 2001N. Series, new ROMS, Large Keyboard, Cassette and Manual. Excellent condition. £220 – Tel: 074 56 7425.

COMMODORE PET 3032. Printer 3022 and Cassette Unit £400 o.n.o. Tel. 0628 825500 – evenings.

PET 32K. With tool kit and Rabbit and Cassette Unit. Approx £75 worth of manuals etc. 70 various games on tapes. Excellent condition. £435. 01-868 9709.

INTERPOD. The Rolls-Royce of Interfaces, unused, cost £144 – sell £80. Magpie, the audiogenic database, cost £120 – sell £75. Dozens of utility and games tapes half price! Tel: 0268-282012.

COMMODORE 3032. With Dual Disk Drive and Printer plus Software DMS and Wordcraft. Accept £800 o.n.o. – Tel: (0233) 41875, Treacher 61 Highfield Road, Ashford, Kent.

COMPUTHINK DOUBLE DRIVES. With Control Board and Lead £350. Dolphin BD80 Printer £175. I-EEE 488/RS232 Interface Unit £100. All for Commodore Pet. Tel: Leics. 673536.

COMPUTER PROGRAMS copied (cassette based only). Printed inlay cards supplied if required. Minimum order 10 cassettes. Phone:– **M.G. COPIES (MIG RECORDINGS) BURNTWOOD 75375 (24 Hr. Answering service).**

HERE'S MY CLASSIFIED AD

____

____

____

____

Please continue on a separate sheet of paper

I make this __________ words, at __________ per word so I owe you £__________

Name __________

Address __________

__________ **Telephone** __________

Send your classified entries to:

**Classified Department,
Commodore Computing International Magazine,
167-169 Great Portland Street,
London W1N 5FD.
Tel: 01-636 6615**

Private readers – advertisements from private readers cost 10p a word.

Trade advertisements – cost 20p a word.

Semi-display – why not make your advertisement more substantial by choosing the semi-display rate. It is only £5 a single column centimetre.

NEW UNEXPANDED VIC 20 GAMES DESIGNER

Make Great Games...
Create your own amazing games with Galactics unique GAMES DESIGNER cassette for the unexpanded VIC 20, only £9.50

EXPLORE EXCITING NEW HORIZONS

Galactic Software

UNEXPANDED VIC 20 GAMES - KEYBOARD OR JOYSTICK.
COMMODORE 64 GAMES - JOYSTICK CONTROL
DRAGON 32 GAMES - KEYBOARD CONTROL

"MAKE GREAT GAMES AND WIN £100 AND FAME!! Send us your best game made with the Galactic GAMES DESIGNER, before 14th March, and have a chance to win £100 plus having your game shown to International Software Dealers and Distributors.

ROBOT MOUSE
£5.50 - VIC 20

SPACE SHUTTLE
£5.50 - VIC 20

GALACTIC SOFTWARE
Unit 7,
Larchfield Estate,
Dowlish Ford,
Ilminster, Somerset.
TA19 0PF
Tel: (04605) 5161

FROGGY £5.50 - VIC 20, Commodore 64 or Dragon 32.

ALL IN MACHINE CODE
- ⋆ Variable degree of difficulty
- ⋆ Make your own Monsters, Moonscapes, Space Ships, Aliens, Kangaroos or Asteroids
- ⋆ Create your very own Games

UNEXPANDED VIC 20
MAKES GREAT GAMES NO PROGRAMMING EXPERIENCE NEEDED
GAMES DESIGNER
INCLUDES 3 GAMES KANGA, ZYON AND KRAZY MAZE
Galactic SOFT WARE

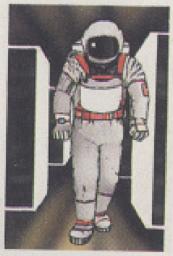
GAMES DESIGNER
for the unexpanded VIC 20 £9.50 inc. P&P.

MAKE GREAT GAMES
- ⋆ No Programming experience needed
- ⋆ Full colour Hi-Res Graphics
- ⋆ Make your own sound effects
- ⋆ Joystick or Keyboard control

DEALERSHIP ENQUIRIES
CONTACT
04605 5161

BUG DIVER
£5.50, VIC 20, Commodore 64 or Dragon 32

3D MAZE
£5.50 - VIC 20



NEUTRON ZAPPER
£5.50 - VIC 20

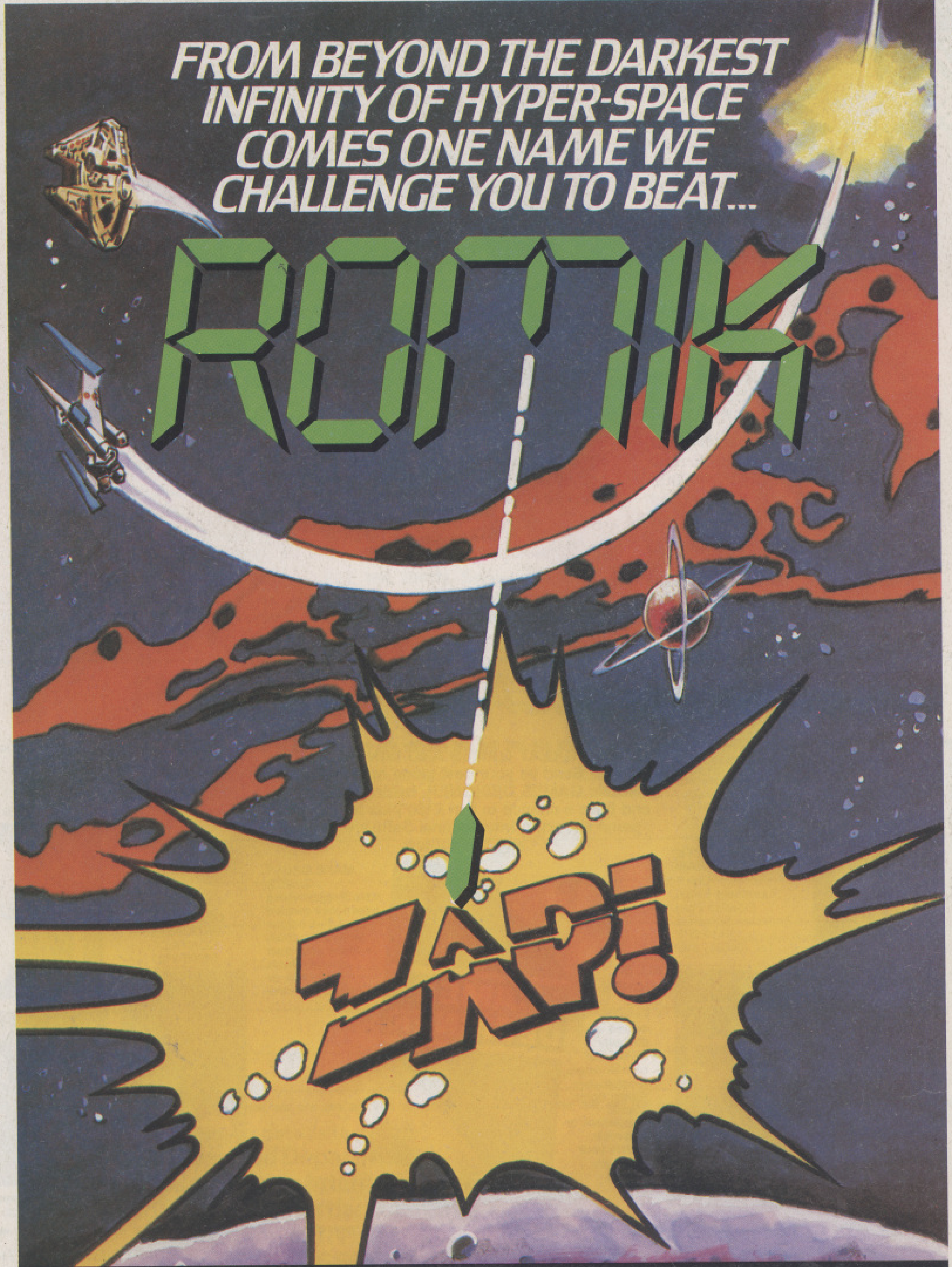
PLEASE SEND ME THE FOLLOWING GAME(S)
(PLEASE TICK APPROPRIATE BOX(S))
☐ BUG DIVER FOR VIC 20 £5.50
☐ 3D MAZE FOR VIC 20 £5.50
☐ FROGGY FOR VIC 20 £5.50
☐ NEUTRON ZAPPER FOR VIC 20 £5.50
☐ ROBOT MOUSE FOR VIC 20 £5.50

MONEY BACK GUARANTEE
☐ SPACE SHUTTLE FOR VIC 20 £5.50
☐ GAMES DESIGNER FOR VIC 20 £9.50
☐ BUG DIVER FOR COMMODORE 64 £5.50
☐ FROGGY FOR COMMODORE 64 £5.50
☐ BUG DIVER FOR DRAGON 32 £5.50
☐ FROGGY FOR DRAGON 32 £5.50

I ENCLOSE A CHEQUE/P.O. FOR THE TOTAL SUM OF £ ____
ACCESS NO ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
NAME ____
ADDRESS ____

Send to GALACTIC SOFTWARE Unit 7, Larchfield Estate, Dowlish Ford, Ilminster Somerset TA19 0PF

4 Westfield Rd
(G)


FROM BEYOND THE DARKEST INFINITY OF HYPER-SPACE COMES ONE NAME WE CHALLENGE YOU TO BEAT...
ROMIK
ZAP!

Games we challenge you to beat...on the 64, Vic 20, Spectrum, ZX81, BBC, Electron, Dragon, Oric, Lynx and Atari. See your local dealer for details.